Environmental Stewardship Goals For My Livestock or Poultry Operation

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Introduction

Objective

The goal of this assessment tool is to help a producer identify priority environmental issues and objectives for your livestock or poultry operation. This tool will:

* Review the value placed by your operation on fundamental principles of environmental stewardship;
* Step your through and identification of primary environmental issues of greatest local concern;
* Encourage establishment of Environmental Stewardship Goals for your livestock or poultry operation based upon this review of guiding principles and issues of specific local concern.

Environmental Benefits

Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

Reduce Nitrogen excretion or losses

Reduced Phosphorus excretion or losses

Reduced Pathogen risk

Improved Farm Aesthetics

Reduced Suspended Solids risk

Reduced Ammonia emission

Reduced Odor risk

Financial Benefits

Why Should I Be Concerned?

The livestock and poultry industry is facing a growing scrutiny of its environmental stewardship. Emotion and lack of understanding by the general public contributes to this scrutiny. Problems also result from a few producers who have contributed to highly visible impacts on the environment due to ignorance or outright disregard for the environment.

However, real environmental concerns also result from livestock and poultry operations owned or managed by well-intentioned producers. Animal production has the potential to negatively affect surface water quality (from pathogens, phosphorus, ammonia, and organic matter); groundwater quality (from nitrate); soil quality (from soluble salts, copper, arsenic, and zinc); and air quality (from odors, dust, pests, and aerial pathogens).

Understanding Water Quality Issues

Manure contains five primary contaminants that impact water quality. Those contaminants, their environmental risk, and common pathway to water are summarized in Table 1.

Table 1. Summary of potential manure contaminants of water quality, the associated environmental risk, and most common pathway to water.

Potential Pollutant	Environmental Risk	*Most Common* Pathway to Water
Nitrate N	Blue Baby Syndrome	Leaching to groundwater
Ammonia-N	Fish kills	Surface water runoff
P	Eutrophication	Erosion and surface water runoff
Pathogens	Human health risk	Surface water runoff
Organic solids	Reduced oxygen level in water body–fish kills	Surface water runoff

For growth and survival, all living things require nitrogen and phosphorus. However, when managed improperly , these nutrients can produce harmful environmental impacts. Nitrate nitrogen can contaminate drinking water (primarily a groundwater issue) restricts the oxygen in the bloodstream in infants under the age of 6 months, causing methemoglobinemia (blue baby syndrome). Infants and pregnant women are at greatest risk. The U.S. EPA has set a maximum contaminant level of 10 parts per million (ppm) for nitrate-N in public water supplies. Ammonia nitrogen in surface water also represents an environmental risk. In most natural surface waters, total ammonia-N concentrations greater than about 2 ppm exceed the chronic criteria for fish..

Most nitrogen in manure exists in an ammonium or organic nitrogen form. In these forms, it is likely to be transported with surface water runoff and erosion. These forms of nitrogen are unlikely to leach through soils. In general, the filtering ability of soil restricts movement of organic compounds, and the negatively charged clay soil particles restrict the movement of positively charged ammonium-N (NH_4^+). If sufficient oxygen is available, ammonium-N can be transformed into nitrate-N (nitrification), which is soluble in water, and can leach through soils to groundwater. Nitrate-N from manure is likely to exist only in soil.

Phosphorus promotes eutrophication, which refers to an abnormally high growth of algae and aquatic weeds in surface waters. As this organic material dies, natural oxygen levels decline, which can cause changes in fish population or fish kills. Other common problems associated with eutrophied water bodies include less desirable or restricted recreational use, unpalatable drinking water, and increased difficulty and cost of drinking water treatment.

Phosphorus typically moves with runoff and erosion. Phosphorus is stored in soils primarily fixed to soil minerals (iron, aluminum, and calcium) or in organic matter (living soil bacteria, crop residue, and partially decayed organic matter). Thus, soil erosion is a primary transport mechanism of phosphorus to surface water.

The role of nutrient loading of surface waters is receiving growing scrutiny due to its contribution to harmful alga blooms in coastal waters. These conditions have resulted in hypoxic (low oxygen level) regions in the Gulf of Mexico, Chesapeake Bay, and other locations. In addition, some alga blooms produce toxins that result in fish lesions and fish kills. Pfiesteria and other related species have been identified in the estuaries of the Mid- and South Atlantic states. Growing evidence exists that nutrient loading is a contributor to these coastal water conditions. While it has not been clearly established that nutrients from agriculture are responsible for outbreaks of Pfiesteria and other harmful alga blooms, there is growing scientific consensus about this linkage.

Pathogens are considered any virus, bacterium, or protozoa capable of causing infection or disease in other animals or humans. Cryptosporidium parvum (C. parvum) and giardia are two pathogens shed in

animal manure of greatest concern for transmission to humans. The concern about these organisms is a result of three factors: (1) A healthy adult human can become infected with relatively few oocytes; (2) These protozoa originate from a variety of domestic animals, wildlife, and humans; and (3) Commonly used water disinfectants such as chlorine are not effective in controlling these protozoa.

C. parvum and giardia are parasites that cause diarrhea, nausea, fever, vomiting, and fatigue in humans. In healthy humans, the infections from either organism are usually self-limiting and do not pose serious health risks. However, the risk can be much greater for the very young, elderly, and those with immune depressed systems.

Pathogens are most likely to be transported to water with surface runoff and erosion or by direct animal access to surface water. Streams and lakes used for drinking water supply and recreational purposes provide the greatest opportunity for transporting these pathogens to humans. Pathogens are unlikely to move through soils to groundwater. Soils provide a filtering mechanism, especially for larger organisms such as protozoa and bacteria.

Organic matter in manure, like nutrients, can be a valuable environmental resource if managed properly or an environmental pollutant if managed poorly. Organic carbon in manure offers positive benefits to the soil including

- Being the primary energy source for an active, healthy soil microbial environment.
- Being an important stabilizer of soil nutrients, especially mobile forms of N.
- Contributing to improved soil structure, which contributes to improved water infiltration, greater water-holding capacity, benefiting crop water stress, soil erosion, and nutrient retention.

Organic matter in the form of manure, silage leachate, and milking center wastewater degrades rapidly and consumes considerable oxygen (often measured as biological oxygen demand, BOD, or chemical oxygen demand, COD). If this occurs in an aquatic environment, oxygen can be quickly depleted contributing to fish kills. Manure, silage leachate, and waste milk can be 50 to 250 times more concentrated than raw municipal sewage (primarily because livestock production does not add the large volume of fresh water that is used in dilution and transport of municipal waste). Organic matter, like pathogens, P, and ammonia, is transported to water primarily by surface water runoff.

Understanding Air Quality Issues

Manure handling and storage associated with confinement livestock and poultry systems result in a wide range of air contaminants. More that 160 volatile compounds have been identified as contributing to the gaseous emissions from confinement facilities. Dust emission from animal housing is gaining greater attention due to its health impact upon neighbors and its ability to serve as a carrier of odor compounds. Finally, the production of non-odorous gases including methane and carbon dioxide is gaining some attention as a potential contributor to global warming.

Odorous volatile compounds are commonly considered to be an unpleasant or nuisance experience by many neighbors. Recent research suggests that neighbors also have strong emotional reactions to livestock-related odors. These reactions can impact psychological health. Research suggests significantly greater anger, confusion, tension, depression, and fatigue in populations living near intensive swine operations.

Physiological responses to odorous compounds are less well understood.. It is unclear if long-term, low-level exposure to compounds can impact the health of neighboring residents. Reports suggest that odors may elicit respiratory problems, nausea, vomiting, and headaches. A consensus among health professionals clearly does not exist at this time.

Some community concerns and regulatory efforts have focused on individual such as hydrogen sulfide. Hydrogen sulfide alone is not considered to be an acceptable indicator of odor. However, health-related concerns are a more common justification of standards or regulations for hydrogen sulfide. Exposure to concentrations of 2,000 ppm for a few minutes can be fatal. Long exposures at 300 ppm have also caused deaths. To avoid these concerns, worker health organizations have established average workplace concentration limits of 10 ppm. Some states have established levels as low as 0.03 ppm to 0.1 ppm for community exposure limits, assuming that a greater range of susceptibility to hydrogen sulfide exposure would be found within the general population than within a healthy workplace population.

Livestock production is a source of greenhouse gases (methane and carbon dioxide). These gases are primary end products of anaerobic and aerobic (carbon dioxide only) decomposition of manure and other byproducts. However, the carbon released from manure originated from plants that removed carbon dioxide as part of the photosynthetic process. Thus, agriculture recycles greenhouse gases as opposed to contributing additional greenhouse gases, which occurs with the combustion of fossil fuels

Ammonia is released in large quantities by livestock production. Anaerobic lagoons may lose more than two-thirds of the nitrogen in manure as ammonia. Open lots for livestock production will volatilize roughly half of the N, primarily as ammonia. Uncontrolled re-deposition of ammonia can lead to water quality concern, especially in coastal waters.

Additional Information?
Lesson 1 of Livestock and Poultry Environmental Stewardship curriculum

How Do I Proceed?

Step 1. Am I a CAFO? Livestock and poultry operations defined as "Concentrated Animal Feeding Operations" generally receive greater regulatory scrutiny. It is important to recognize if your operation is likely to be considered a CAFO when compared to federal and state rules. If it is, the liability associated with environmental issues increases substantially. Use the "Am I a CAFO" assessment tool to review your operation.

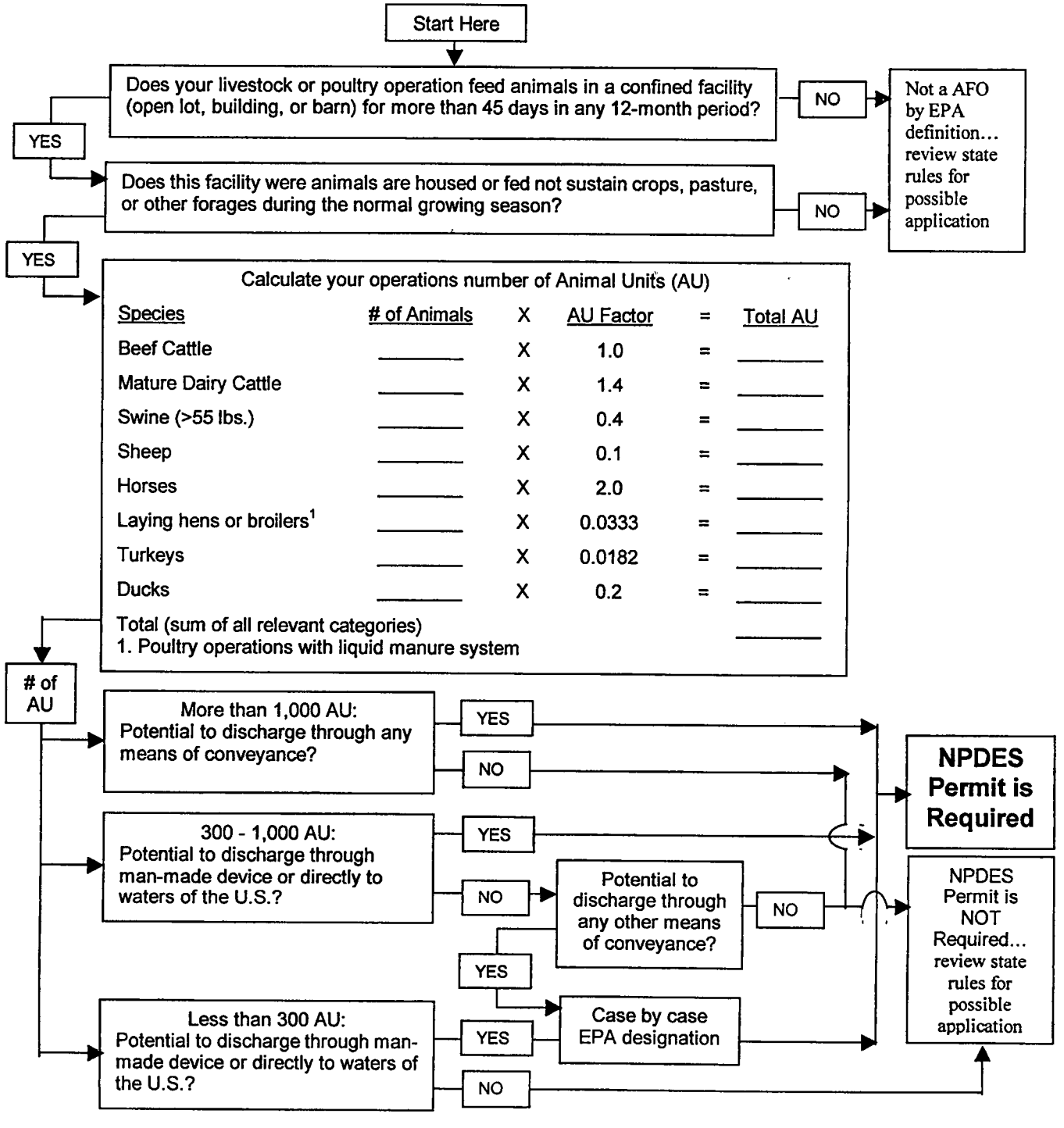
Step 2. What value do you place on fundamental Environmental Stewardship Principles. The Environmental Stewardship Principles tool assists you with a review of your operations performance when compared to several fundamental principles of good stewardship.

Step 3. Primary Environmental Issues of Local Concern. Livestock production presents several potential concerns for the environment. Depending on your location, some issues will have greater importance than others will due to greater local concern or scrutiny or greater regulatory emphasis. Your plans for improving environmental stewardship should focus available resources on those issues of greatest local concern.

Step 4. An Environmental Policy and Goals statement should be developed for your livestock or poultry operation to address the highest priority environmental issues. This policy statement and goals should address high priority issues that may have become more apparent, in part, from the assessments completed in the three previous steps.

Regulatory Review: Is My Animal Feeding Operation a CAFO?

Purpose: Animal Feeding Operations (AFO's) that are define as Concentrated Animal Feeding Operations (CAFO's) are subject to significantly greater regulatory scrutiny both at the federal and state level. The following procedures are currently used by US EPA to identify livestock and poultry operations that are classified as CAFO's and thus subject to the permit requirements and rules of the National Pollution Discharge Elimination System (NPDES). This tool will assist in identifying if a US EPA review would classify your operation as a CAFO.



Regulatory Review: Is My Animal Feeding Operation a CAFO? (continued)

Instructions: Many states use different rules for defining livestock operations that are regulated. In addition, the EPA regulations are often interpreted differently by EPA Regional offices or state regulatory agencies that have accepted responsibility for implementing the NPDES permit program for livestock and poultry operations.

The goal of this assessment package is to help a livestock or poultry producer identify those differences applicable to your situation. For each issue listed (left hand column) of the worksheets, identify if this issue is regulated by federal, state, or local authorities (middle column), and determine if your operation is in compliance with these rules (right hand column).

Instructions to State Pilot Team: *This is meant to be a template for you to modify to address state specific regulations before producers use it. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response. Current federal NPDES regulations do not address nutrient management planning. Thus no summary of federal rules are included.*

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Am I a CAFO according to these rules?
What agency(ies) is(are) involved in administrating NPDES regulations in your state?	___ US EPA Regional Office ___ State ___ Local *List Name, Address, Phone #:*	
NPDES Rules Specific to Your State		
Are the procedures detailed on the previous page applied differently in your state.		___ Yes ___ No ___ Not applicable ___ Don't Know
Are certain livestock or poultry species targeted for NPDES permits in your state?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are certain animal facilities (e.g. open lots) targeted for NPDES permits in your state?		___ Yes ___ No ___ Not applicable ___ Don't Know
State Rules for Identifying Regulated Livestock or Poultry Producers		
Is size of animal feeding operation considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know
Is animal species considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know
Is type of animal facility considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know
Is liquid vs. dry manure handling systems considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are environmental risk factors considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know
Other issues considered in identifying regulated producers?		___ Yes ___ No ___ Not applicable ___ Don't Know

Environmental Stewardship Principles for Confinement Livestock and Poultry Systems

Purpose: The purpose of this exercise is to identify stewardship principles upon which you place value and the level of implementation of that principle on you livestock or poultry operation. Check the response that best describes your livestock or poultry operation for each principle.

Environmental Stewardship Principle "My livestock operation..."	I place a high value on this stewardship principal. AND I have fully implemented this principle on my livestock or poultry operation	I place a high value on this stewardship principal. AND I have made progress towards implementing this principle on my livestock or poultry operation	I place a moderate value on this stewardship principal. AND I have taken some initial steps toward implementing this principle on my livestock or poultry operation	I place little or no value on this stewardship principal. AND I have made few or no efforts towards implementing this principle on my livestock or poultry operation.
"...has completed a review of environmental risks and identified high-priority environmental issues."				
"... does not discharge manure or contaminated water from animal housing or manure handling and storage facilities."				
"...maintains a balance in nutrients entering and leaving (as managed products)."				
"...implements a nutrient plan for land application of manure ."				
"...is a good neighbor."				
"...complies with all environmental regulations."				
"...considers environmental and neighbor impacts before expansion of animal numbers or facilities."				
"... "				

Environmental Stewardship Principles for Pasture and Range Based Livestock Systems

Purpose: The purpose of this exercise is to identify stewardship principles upon which you place value and the level of implementation of that principle on you livestock or poultry operation. Check the response that best describes your livestock or poultry operation for each principle.

Environmental Stewardship Principle "My livestock operation..."	I place a high value on this stewardship principal. AND I have fully implemented this principle on my livestock or poultry operation	I place a high value on this stewardship principal. AND I have made progress towards implementing this principle on my livestock or poultry operation	I place a moderate value on this stewardship principal. AND I have taken some initial steps toward implementing this principle on my livestock or poultry operation	I place little or no value on this stewardship principal. AND I have made few or no efforts towards implementing this principle on my livestock or poultry operation.
"...has completed a review of environmental risks and identified high-priority environmental issues."				
"... does not allow runoff from corrals, winter feeding areas and other confinement facilities to reach waters of the state or nation."				
"...manages pasture and range resources to insure sustainable forage production."				
"...includes, at a minimum, an active yearly documented resource monitoring system"				
...manages pasture and range resources to insure wildlife habitat"				
"...manages riparian areas and other buffers to surface water to protect and enhance the quality of the water."				
"...is a good environmental neighbor."				
"...complies with all known environmental regulations."				
"...considers environmental impact on land and forage sustainability as a watershed resource before expansion of animal numbers or facilities."				
"				

Primary Environmental Issues of Local Concern

Purpose: The purpose of this exercise is to identify environmental issues of greatest local concern based upon issues that are regulated or issues that receive significant local attention. Identify from the issues listed below those environmental topics of greatest local concern.

Environmental Issue	Check importance of environmental issue locally.			Is this issue regulated?
	High	Medium	Low	
Water Quality				
Nitrate contamination of groundwater.				Yes No Don't Know
Nutrients in runoff water causing Eutrophication (algae blooms)				Yes No Don't Know
Direct discharges or spills to surface water				Yes No Don't Know
Pathogen contamination of drinking water.				Yes No Don't Know
Soil erosion or suspended solids into surface waters				Yes No Don't Know
Has a TMDL Review been completed for local surface waters				
Other:_____				Yes No Don't Know
Air Quality				
Odors				Yes No Don't Know
Dust				Yes No Don't Know
Ammonia volatilization and deposition				Yes No Don't Know
Hydrogen sulfide				Yes No Don't Know
Other:_____				Yes No Don't Know
Neighbor Relations				
Are their neighbors in close proximity of my operation one-mile) that may expose your operation to nuisance complaints?				Yes No Don't Know
Are there neighbors in close proximity that express health-related concerns or might be at greater risk (e.g. those with asthma)				Yes No Don't Know
Is their community, business, or recreational facilities or major roads within close proximity that brings the public into contact with my livestock operation.				Yes No Don't Know
Other:_____				Yes No Don't Know

Environmental Stewardship Policy and Goals

Purpose: It is important that all livestock and poultry operations have established the Environmental Stewardship Policy and supporting Goals. These policy and goal statements should be in writing and shared with family members, employees, and key advisors or partners involved in the management of your operation.

Your policy statement should identify fundamental principles of environmental protection that your agricultural operation including management, family, and employees strive. to achieve. These goals should identify the fundamental standards that you hope to achieve.

Environmental Policy for _____ **farm**

Your farms environmental stewardship goals may address several factors including:

- Your own stewardship values;
- Regulations that currently or may soon impact your operation;
- The ability of your operation to achieve the seven basic principles of environmental stewardship for a livestock or poultry operation.

Identify the key environmental goals that you hope to achieve. At the conclusion of your on-farm environmental assessment for individual components of your farm, you may want to revise these goals., you will be asked to identify the specific steps you plan to take to implement these goals.

Goal #1: _____

Goal #2: _____

Goal #3: _____

Goal #4: _____

Farm Nutrient Balance Assessment Module

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Objective

Concentration or accumulation of nutrients on your livestock or poultry operation beyond the capacity of local soil and cropping systems is the underlying cause of most water quality problems associated with animal feeding operations. These worksheets will allow an individual producer to:

- Identify if concentration (or imbalance) of nutrients is an issue of concern for your operation;
- Select the appropriate nutrient management strategy(ies) for achieving a sustainable nutrient balance within your operation.
- Review current feeding and manure transfer programs for reducing nutrient concentration.

Environmental Benefits

Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

N Reduce Nitrogen excretion or risk

P Reduced Phosphorus excretion or risk.

Pa Reduced Pathogen risk

A Improved Farm Aesthetics

SS Reduced Suspended Solids risk

NH_3 Reduced Ammonia emission

O Reduced Odor risk

$ Financial Benefits

Why Should I Be Concerned?

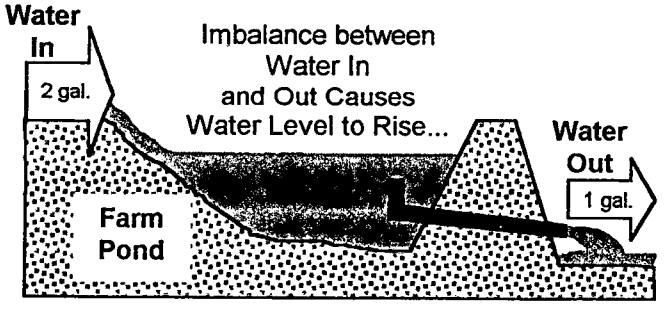
The very first question that should be raised in nutrient management planning is:

"Is my livestock (or poultry) farm concentrating nutrients?"

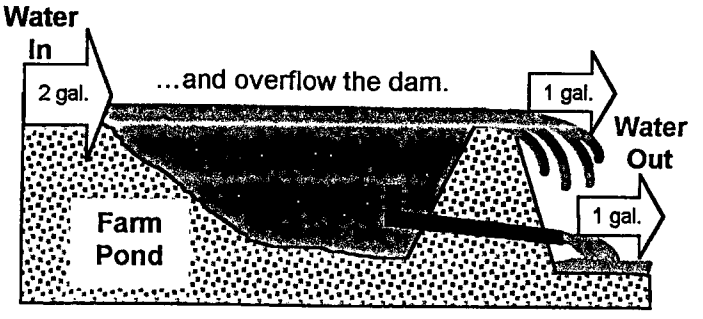
For most of the U.S. livestock industry, concentration of nutrients within livestock and poultry operations represents the underlying cause of nutrient losses to the environment.

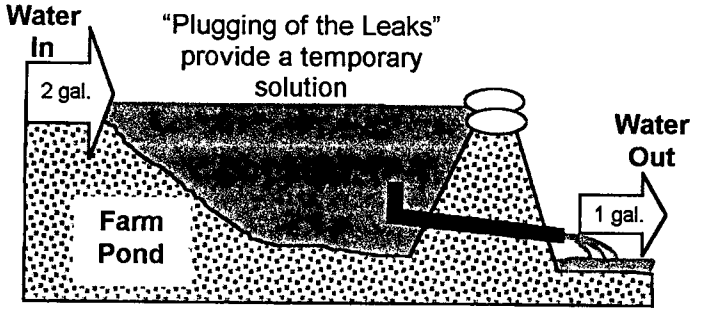
Our current tendency is to focus our nutrient planning processes on a small part of the total nutrient picture, such as the nutrients in manure and their use in crop production. This approach addresses single field concentrations of nutrients. However, this manure nutrient focus severely limits an understanding of the underlying cause of nutrient concentration as well as the long-term sustainable strategies for solving this concern. An understanding of the "whole farm" nutrient picture is necessary for long term solutions.

An analogy between a whole farm nutrient balance for a livestock operation and water flow in a farm pond can be drawn. The farm pond is the equivalent of your entire livestock and cropping operation (whole farm). The water in is the nutrient imported to your farm (purchased feeds and fertilizer, purchased animals, and legume fixed nitrogen). The water out of the pipe is equivalent to the nutrients leaving your farm as managed products (animals and crops sold, manure transferred off-farm). If the flow of water into the pond exceeds the outflow, the pond level rises. Similarly, if the nutrients entering a livestock operation exceed the nutrients leaving as managed products (e.g. crops and animals sold), nutrient concentrate within a farm (rising soil phosphorus levels).



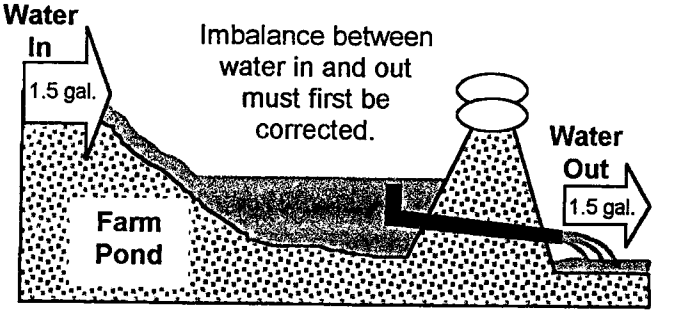
If that imbalance is sustained, water eventually flows over the top of the dam with potentially catastrophic results. Similarly with nutrients, the imbalance is eventually corrected by additional losses to the environment (e.g. ammonia volatilization, or nitrates leaching to groundwater, or phosphorus exiting with runoff and erosion) of similar magnitude as the imbalance. A sustained nutrient imbalance drives the nutrient related contamination of water





Sandbags provide a temporary solution to this problem. However, if the water imbalance is not corrected, water level will in time exceed what the sandbags can hold back. Many current Best Management Practices (BMP's) focus on plugging leaks without correcting the origin of the imbalance. BMP's such as grass filter strips, no applications on frozen soil, or soil erosion control do not correct the imbalance and provide only short-term benefits.

The imbalance of water flows must first be corrected to save the dam and the property downstream. The water entering the pond will need to be reduced and/or the water exiting the outlet pipe must be increased to achieve a relative balance. Similarly, any nutrient management planning process must first achieve a whole farm nutrient balance. The nutrients arriving on farm must be in rough balance with those exiting the farm in managed products. After a balance is achieved, then additional BMP's design to plug the leaks will provide additional long-term benefits.

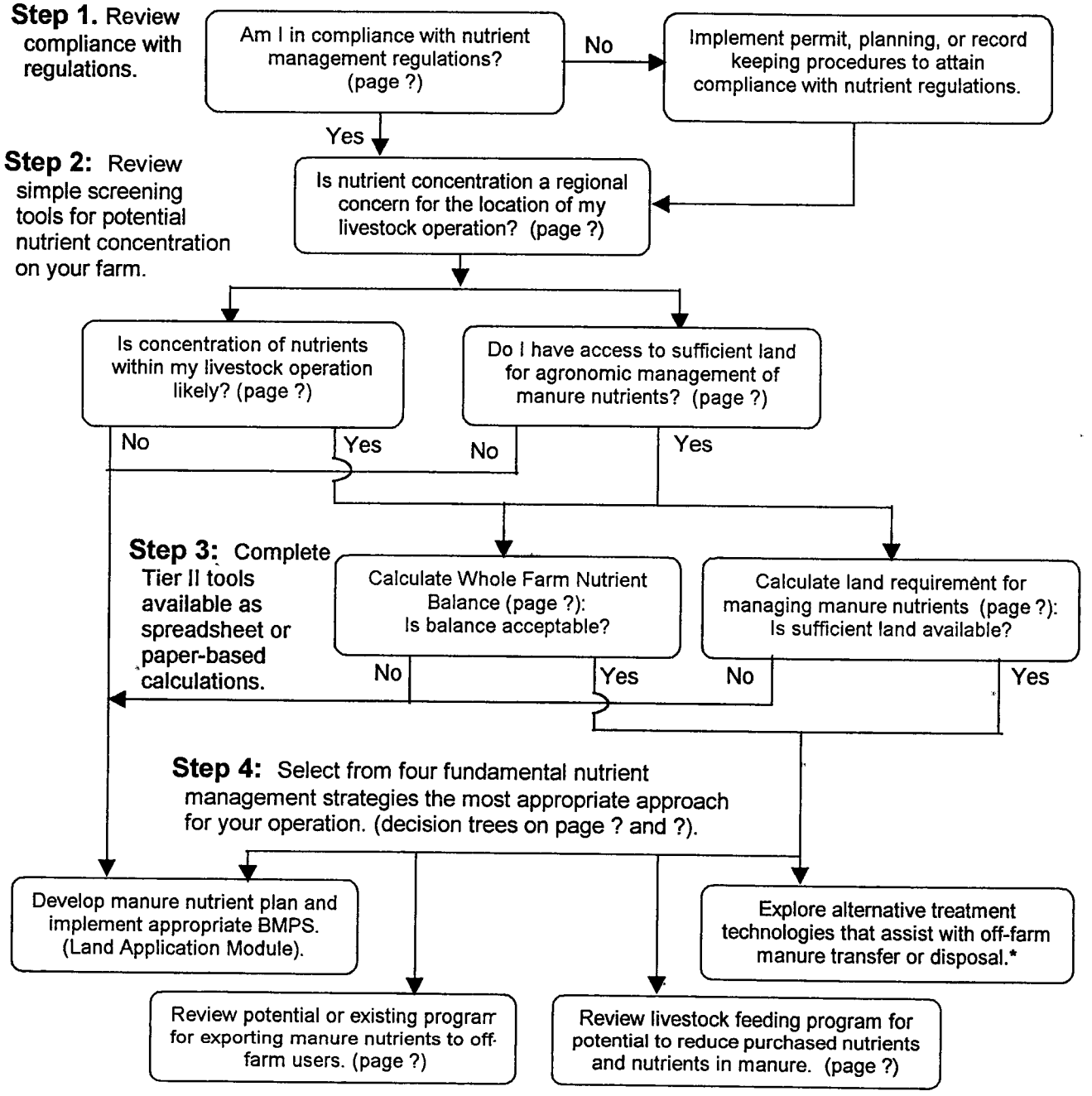


Three tools are provided in this section to address whole farm nutrient imbalance issues:

- The "Whole Farm Nutrient Balance" assessment tool identifies the magnitudes of all nutrient sources entering and leaving (as managed products) as well as the magnitude of any imbalance. This is the preferred assessment tool because it will assist the producer in identifying from four fundamental nutrient management strategies the most appropriate strategy for an individual farm. It will also provide an excellent "yardstick" for measuring improvements in nutrient management performance.
- A "Calculator of Land Requirements" provides a strong indicator of situations with significant imbalances (farms with insufficient land base for utilizing manure nutrients). Most producers can easily provide the input data for this tool. However, it provides less guidance as to the best nutrient management strategy for an individual farm.
- Because of the relative complexity of these two tools, three preliminary screening tools are also available to determine if nutrient concentration or imbalance is an issue deserving your consideration.

Additional Information
Lesson 2, "Whole Farm Nutrient Planning" of Livestock and Poultry Environmental Stewardship curriculum.

How Do I Proceed for reviewing my livestock operation's nutrient balance or imbalance?



* No assessment tools are provided for the alternative treatment technologies nutrient strategy. Additional information is available from the Livestock and Poultry Environmental Stewardship curriculum, Lesson 25, Manure Treatment Options.

Regulatory Compliance Review: Nutrient Management Planning Requirements

Instructions: The goal of this assessment package is to help a livestock or poultry producer identify regulations that apply their operation. For each issue listed (left hand column) of the worksheets, identify if this issue is regulated by federal, state, or local authorities (middle column), and determine if your operation is in compliance with these rules (right hand column).

Instructions to State Pilot Team: *This is meant to be a template for you to modify to address state specific regulations before producers use it. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response. Current federal NPDES regulations do not address nutrient management planning. Thus no summary of federal rules are included.*

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Is my livestock/ poultry operation in compliance?
What agency(ies) is (are) involved in administrating regulations related to nutrient management?	___ US EPA ___ State ___ Local *List Name, Address, Phone #:*	
Nutrient Management Planning Requirements		
Is comprehensive nutrient management planning required?		___ Yes ___ No ___ Not applicable ___ Don't Know
Is manure nutrient management planning as it relates to crop production required?		___ Yes ___ No ___ Not applicable ___ Don't Know
Is documentation of available land base for managing manure nutrients required?		___ Yes ___ No ___ Not applicable ___ Don't Know
Animal Feeding Program		
Is phytase required in diets for non-ruminant livestock or poultry?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are additional measures required of animal feeding programs or diet formulations?		___ Yes ___ No ___ Not applicable ___ Don't Know
Manure Transfer to Off-Site Users		
Are you required to maintain records on transfer of manure to off-site users?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are off-site users required to have a nutrient management plan or records?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to furnish any information to off-site users along with the manure?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to maintain a Land Application Site Agreement for land that you do not own?		___ Yes ___ No ___ Not applicable ___ Don't Know
Other related issues?		___ Yes ___ No ___ Not applicable ___ Don't Know

[1] Comprehensive plan would review multiple issues possibly including feeding program, manure use in cropping program, manure transfer to off farm users, manure storage systems, erosion control program, and alternative treatment technologies.

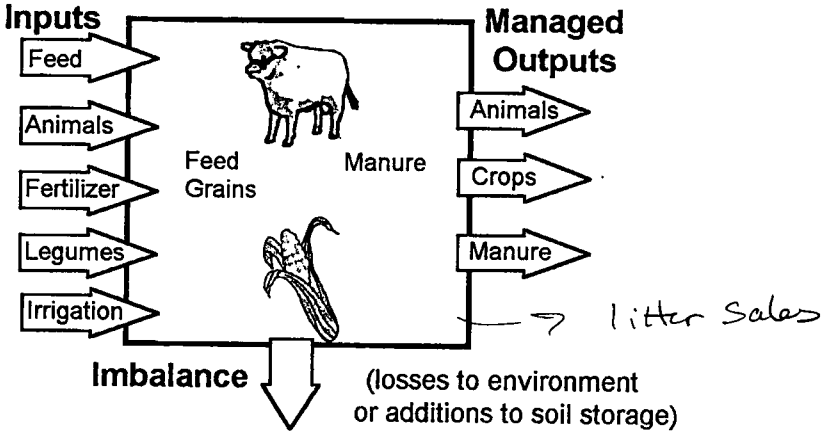
Systems and Management Review: Is Nutrient Concentration an Issue for My Livestock Operation?

Purpose

Nutrients arrive on the livestock farm (Inputs) in the form of feed, fertilizer, irrigation water, animals, or nitrogen fixed by legumes. It is desirable that these nutrients leave the farm as marketed products (Managed Outputs) such as animals or crops. Any imbalance between Inputs and Managed Outputs results in a concentration of nutrient which will either 1) be added to soil reserves (adding to future environmental risks) or 2) lost directly to the environment.

Is nutrient concentration occurring on my livestock operation? Understanding the potential for this concern is critical to identifying a nutrient management strategy for reducing an imbalance and achieving an environmentally sustainable operation.

Are Inputs and Managed Outputs in Balance?



Instructions

Three preliminary screening worksheets will provide an indication as to whether or not concentration of nutrients on your livestock operation is of concern. If these assessment tools suggests concerns, you may want to visit with an advisor about a more detailed estimate of actual whole farm nutrient balance or a calculation of the land requirements for agronomic management of manure nutrients.

Environmental Benefits: N P

Systems and Management Review:
Is nutrient concentration a regional concern for the location of my livestock operation?

Regional nutrient concentration have developed in the last 50 years as livestock/poultry production and feed grain production has concentrated in regions separate, from feed grain production areas of the country (see Figures 1 and 2). Examples of these regional nutrient distribution problems include the concentration of pork production in North Carolinas, poultry concentration in southern and mid-Atlantic states, beef cattle production in the High Plains, and dairy in western, north central, and northeastern states. Many of these regions import significant quantities of nutrients primarily as feed grains from the Corn Belt. The nutrients excreted by these animals can overwhelm the ability of locally grown crops to recycle these nutrients. These regional distribution problems (shaded areas in Figures 1 and 2) represent the animal feeding industry's most difficult nutrient challenges. If your production facility in located in one of these regions, your challenges for managing nutrients may be increased and potential for future expansion reduces.

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Is Concentration of Nutrients A Regional Concern for Livestock or Poultry Production?					
Is your farm located in a county with excess Nitrogen Concentration? (see Figure 1)	Greater than 100% of county's crop nitrogen removal can be supplied by manure nitrogen.	50 to 100% of county's crop nitrogen removal can be supplied by manure nitrogen.	25 to 50% of county's crop nitrogen removal can be supplied by manure nitrogen.	Less than 25% of county's crop nitrogen removal can be supplied by manure nitrogen.	N
Is your farm located in a county with excess Phosphorus Concentration? (see Figure 2)	Greater than 100% of county's crop phosphorus removal can be supplied by manure phosphorus.	50 to 100% of county's crop phosphorus removal can be supplied by manure phosphorus.	25 to 50% of county's crop phosphorus removal can be supplied by manure phosphorus.	Less than 25% of county's crop phosphorus removal can be supplied by manure phosphorus.	P

If a High Risk or High-Moderate Risk factor is identified for the location of your livestock operation, most livestock operations in your region are experiencing challenges with concentration of nutrients. There simply may not be sufficient cropland within the region for manure nutrients to be land applied. It also suggests that additional livestock industry expansion in this region will pose a severe environmental challenge.

However, a High Risk response does not suggest that your operation have the same problem with nutrient concentration. You should review whether or not concentration of nutrients is of concern for your own livestock operation by using the next two assessment tools addressing nutrient concentration for your farm and land requirements for managing manure nutrients produced by your farm.

Figure 1. Potential of nitrogen available in animal manure to meet or exceed plant uptake and removal for harvested crops and hay land. Source: R. L. Kellogg and C. H. Lander. 1999. Trends in the Potential for Nutrient Loading from Confined Livestock Operations. NRCS/USDA. http://www.nhq.crcs.usda.gov/land/pubs/ntrend.html .

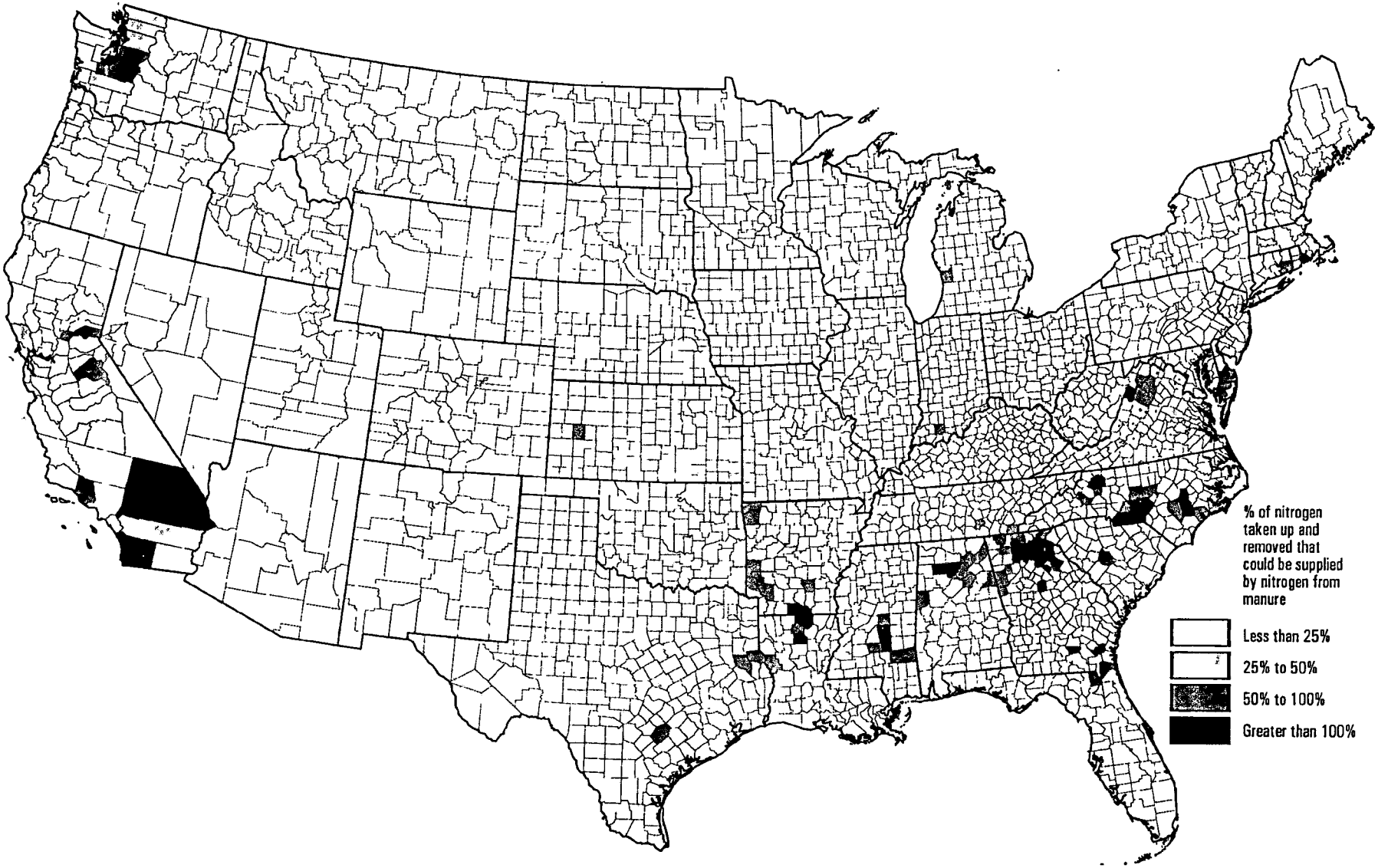
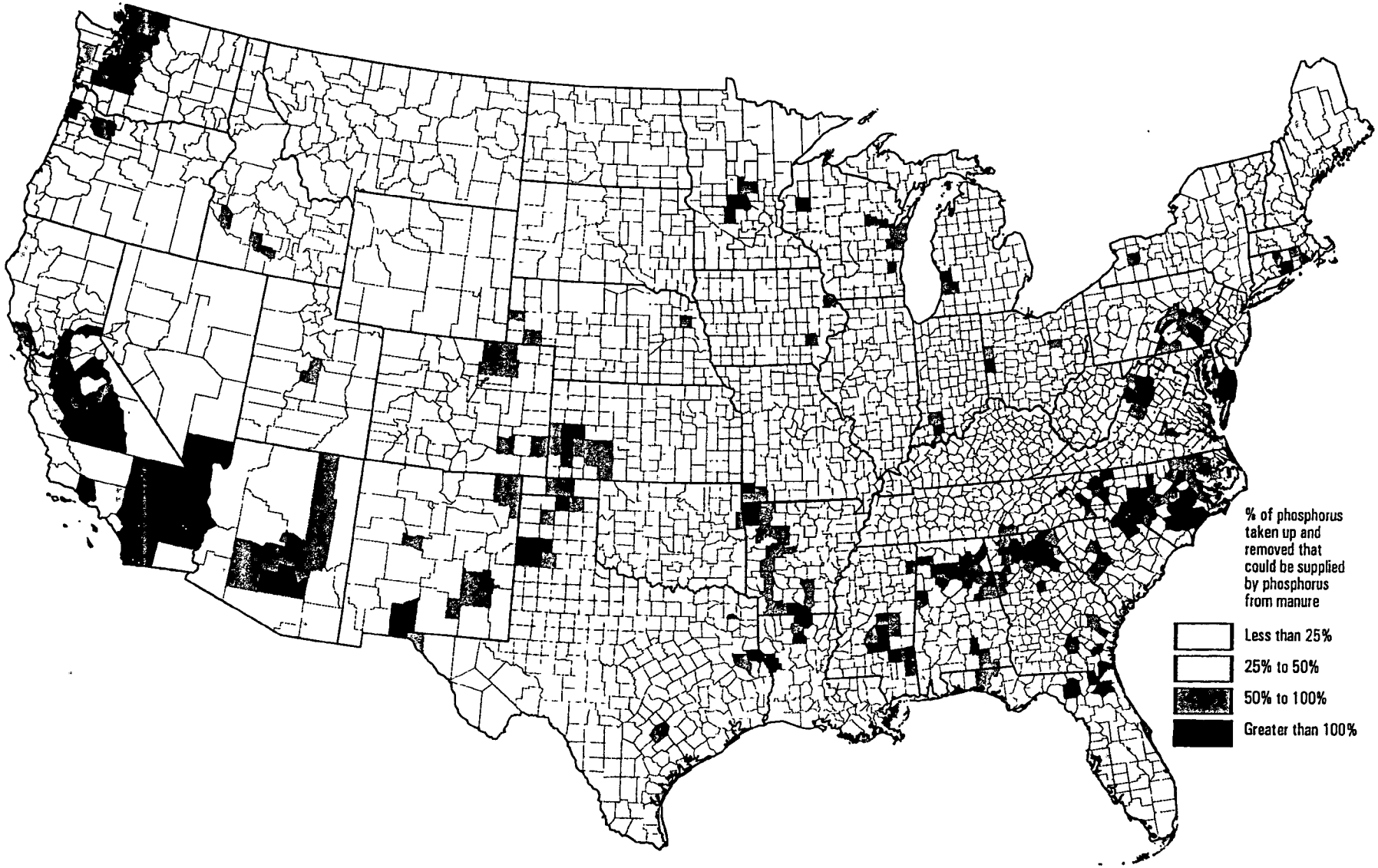


Figure 2. Potential of phosphorus available in animal manure to meet or exceed plant uptake and removal for harvested crops and hay land. Source: R. L. Kellogg and C. H. Lander. 1999. Trends in the Potential for Nutrient Loading from Confined Livestock Operations. NRCS/USDA. http://www.nhq.crcs.usda.gov/land/pubs/ntrend.html .



Systems and Management Review: Is concentration of nutrients within my livestock operation likely?

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply. If one or more high risk factors are identified, a calculation of Whole Farm Balance should be completed. See page ??.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Is Concentration of Nutrients Within Your Livestock Operation Likely?					
Soil phosphorus levels	Soil P test levels are increasing with time (beyond agronomic needs) on a majority of fields owned by the livestock operation OR Soil P test levels are identified "Very High" on recent soil tests for a majority of fields		Soil P test levels are increasing with time (beyond agronomic needs) on some fields owned by the livestock operation OR Soil P test levels are identified "High" on recent soil tests for a majority of fields	Soil test P levels are remaining stable with time on a majority of fields owned by the livestock operation. OR Soil P levels are identified "Low" or "Medium" on recent soil tests for a majority of fields	P
Source of animal feed protein and phosphorus	The majority (more than 50%) of the protein and phosphorus in the ration originates from off-farm sources.*		Between 50 and 75% of the protein and phosphorus in the ration originates from land owned by the livestock operation and currently receiving manure.*	At least 75% of the protein and phosphorus in the ration originates from land owned by the livestock operation and currently receiving manure.	N P
If the majority of protein and phosphorus in the ration originates from off-farm sources, is manure transferred to off-farm users.	No manure is transferred to off-farm users	A smaller fraction of the manure is transferred to off-farm users as the fraction of feedstuffs arriving from off-farm crop producers.		A comparable fraction of the manure is transferred to off-farm users as the fraction of feedstuffs arriving from off-farm crop producers.	N P

Systems and Management Review:
Do I have access to sufficient land for agronomic management of manure nutrients?

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

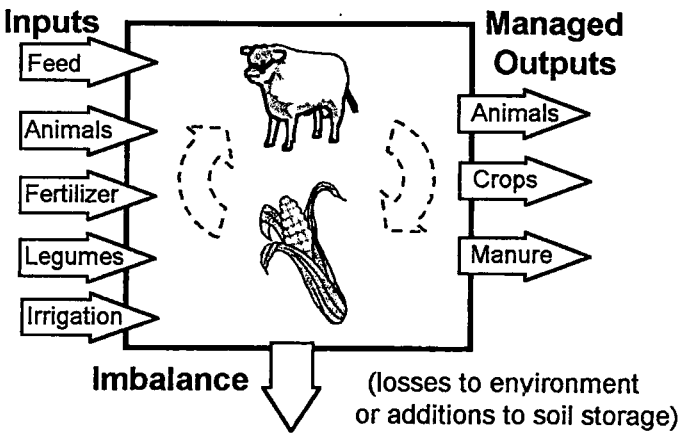
Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Is Concentration of Nutrients Within Your Livestock Operation Likely?					
Is sufficient land available for managing manure nutrients.	Insufficient land available for managing either nitrogen or phosphorus in manure. OR	Sufficient land is available for managing all nitrogen and less than half of the phosphorus in manure. OR	Sufficient land is available for managing all nitrogen and more than half of the phosphorus in manure. OR	Sufficient land for managing all nitrogen and phosphorus in manure. OR	
Beef cattle in feedlot Open Lot Manure Storage	 >4.5 beef feeders/crop ac. >3.7 beef feeders/crop ac.	 1.6 to 4.5 beef feeders/crop ac. 1.5 to 3.7 beef feeders/crop ac.	 0.8 to 1.6 beef feeders/crop ac. 0.8 to 1.5 beef feeders/crop ac.	 <0.8 beef feeders/crop ac. <0.8 beef feeders/crop ac.	
Dairy – lactating herd Open Lot Manure Storage Anaerobic lagoon	 >1.6 lactating cows/crop ac. >1.3 lactating cows/crop ac. >4.8 lactating cows/crop ac.	 0.9 to 1.6 lactating cows/crop ac. 0.9 to 1.3 lactating cows/crop ac. 2.6 to 4.8 lactating cows/crop ac.	 0.5 to 0.9 lactating cows/crop ac. 0.4 to 0.9 lactating cows/crop ac. 1.3 to 2.6 lactating cows/crop ac.	 <0.5 lactating cows/crop ac. <0.4 lactating cows/crop ac. <1.3 lactating cows/crop ac.	
Dairy – dry cows Open Lot Manure Storage Anaerobic lagoon	 > 3.3 dry cows/crop ac. > 2.6 dry cows/crop ac. >9.4 dry cows/crop ac.	 1.2 to 3.3 dry cows/crop ac. 1.2 to 2.6 dry cows/crop ac. 3.3 to 9.4 dry cows/crop ac.	 0.6 to 1.2 dry cows/crop ac. 0.6 to 1.2 dry cows/crop ac. 1.7 to 3.3 dry cows/crop ac.	 < 0.6 dry cows/crop ac. < 0.6 dry cows/crop ac. < 1.7 dry cows/crop ac.	
Dairy replacements Open Lot Manure Storage Anaerobic lagoon	 > 6.5 heifers/crop ac. > 6.0 heifers/crop ac. > 19 t heifers/crop ac.	 5.5 to 6.5 heifers/crop ac. 5.2 to 6.0 t heifers/crop ac. 15 to 19 heifers/crop ac.	 2.7 to 5.5 heifers/crop ac. 2.6 to 5.2 heifers/crop ac. 7.5 to 15 heifers/crop ac.	 < 2.7 t heifers/crop ac. < 2.6 heifers/crop ac. < 7.5 heifers/crop ac.	
Poultry - layers Manure pit Anaerobic lagoon	 > 200 layers/crop ac. > 830 layers/crop ac.	 150 to 200 layers/crop ac. 440 to 830 layers/crop ac.	 77 to 150 layers/crop ac. 220 to 440 layers/crop ac.	 < 77 layers/crop ac. < 220 layers/crop ac.	
Poultry - broilers on litter	> 300 broilers/crop ac.	240 to 300 broilers/crop ac.	120 to 240 broilers/crop ac.	< 120 broilers/crop ac.	
Poultry - turkeys on liter	> 66 turkeys/crop ac.	45 to 66 turkeys/crop ac.	22 to 45 turkeys/crop ac.	< 22 turkeys/crop ac.	

Assumes crop requirement of 150 lbs. N and 60 lbs. P_2O_5s per acre of cropland. Also assumes 50% of manure-N is crop available. NRCS (1992) estimates for nutrient excretion and nutrient losses from manure management systems were used with one exception. Van Horn (199?) was used for dry and lactating cows (70 lbs. of milk per day).

Rick, Don't Forget. Modify poultry calculations with Paul Patterson's numbers.

Systems and Management Review: Estimating A Whole Farm Nutrient Balance

Whole Farm Nutrient Balance



Instructions

A whole farm nutrient balance focuses on establishing the magnitude of all nutrient Inputs and Managed Outputs. The difference or Imbalance is a yardstick for measuring the magnitude of environmental risk associated with nutrients for a livestock operation. To complete a whole farm nutrient balance, the magnitude of the eight Input and Managed Output arrows must be calculated.

This balance is focused on the nutrients that cross the border of the farm. It is not concerned with nutrients recycled within the farm. For example, home grown crops fed to animals raised on your farm will not be considered as they do not cross the farm's boundary. Purchased feed products will be included because this nutrient input crosses the farm's boundary.

The boundary of the farm includes all owned or rented land that you farm (do not include land that is rented to others) and all livestock production facilities.

It is suggested that the nutrient balance be estimated for a one-year period.

For each arrow in the illustration, the total weight and nutrient concentration crossing the farm's boundary is required. Typically this will include

- Total feed purchased and nutrient concentration (feed sample analysis is preferred but table values for concentration are provided);
- Total fertilizer purchased and nutrient concentration (table values for concentration are provided);
- Total animals purchased and sold (nutrient concentration is provided);
- Total acres of legumes grown that are not fertilized with manure and approximate crude protein content;
- Total crops grown and their nutrient concentration (table values for concentration are provided);
- Total irrigation water pumped and nitrate concentration.

Environmental Benefits: N P

Reference

Lesson 2, "Whole Farm Nutrient Planning" of Livestock and Poultry Environmental Stewardship curriculum is recommended. Web site http://manure.unl.edu/koelsch-nbalance.html provides access to a spreadsheet for completing these calculations.

I. LIVESTOCK

A. LIVESTOCK INPUTS: For a one year period, enter the number of animals purchased (including custom fed animals), their average live purchase weight, and the appropriate nutrient factor.

Livestock Group	a. Number of Animals	b. Average Purchased Weight (lbs.)	Nitrogen		Phosphorus	
			c. Ref. Table 1, Fraction	Total = a x b x c	d. Ref. Table 1, Fraction	Total = a x b x d
Example: Calves	*3,000*	*600 lbs.*	*0.027*	*48,600 lb. N*	*0.0073*	*13,100 lb. P*
1.						
2.						
3.						
4.						
TOTAL						

B. LIVESTOCK OUTPUTS: For a one year period, enter the number of animals sold or shipped off the farm, and their average live selling weight (include custom fed animals, culls and mortality shipped off farm),.

Livestock Group	a. # of Animals	b. Average Sell Weight (lbs.)	Nitrogen		Phosphorus	
			c. Ref. Table 1 Fraction	Total = a x b x c	d. Ref. Table 1, Fraction	Total = a x b x d
Example: Finish Cattle	*2,800*	*1,250 lbs.*	*0.024*	*84,000 lb. N*	*0.0065*	*22,800 lb. P*
1.						
2.						
3.						
4.						
TOTAL						

C. ANIMAL PRODUCTS OUTPUTS: For a one year period, enter the quantity of animal products sold and nutrient concentration if you have an analysis for your own animal products.

Animal products	a. Pounds of animal products sold.	Nitrogen		Phosphorus	
		b. Nitrogen Fraction	= a x b	c. Phosphorus Fraction	= a x c
Milk		0.0050[1]		0.001	
Eggs		0.019		0.002	
Wool		0.12		0.0001	
TOTAL					

1. Assumes 3.2% protein in milk. The nitrogen factor can be estimated as follows: Nitrogen Factor = % Crude Protein / 638

D. CHANGE IN ANIMAL INVENTORY (beginning vs. end of year). For those livestock groups that have changed in numbers fed from the beginning to the end of the year, indicate that change in inventory below.

	January 1		December 31		Nitrogen		Phosphorus	
	a. Number of Animals	b. Average Sell Weight	c. Number of Animals	d. Average Sell Weight	e. Ref. Table 1, Fraction	Total = (c x d x e) – (a x b x e)	f. Ref. Table 1, Fraction	Total = (c x d x f) – (a x b x f)
Example	*1,500*	*925*	*1,700*	*925*	*0.027*	*5,000 lb. N*	*0.0073*	*1,400 lb. P*
1.								
2.								
TOTAL								

II. FEEDS, FORAGES, GRAINS, AND OTHER CROPS

E. INPUTS (include grain, supplement, hay, greenchop, silage, bedding, and minerals purchased). For a one year period, list all feed purchases, quantity, fraction dry matter, and nutrient concentrations (use Reference Table 3 if unknown). If nutrient concentration is reported on a wet weight basis (as fed basis), enter a "1" for % DM.

All Purchased Feeds			Nitrogen		Phosphorus	
List Feed	a. Pounds Purchased	b. Fraction DM[1]	c. Fraction CP	Total = a x b x c / 6.25	d. Fraction P	Total = a x b x d
Example: Hay	*250,000 lbs.*	*0.91*	*0.17*	*6,200 lb.*	*0.0024*	*550 lb.*
1.						
2.						
3.						
4.						
5.						
TOTAL						

F. OUTPUTS (include grain, hay, silage, and straw sold). Follow same directions as Inputs.

Crops and Feeds Sold			Nitrogen		Phosphorus	
List Feed	a. Pounds Sold	b. Fraction DM [1]	c. Fraction CP	Total = a x b x c / 6.25	d. Fraction P	Total = a x b x d
Example: Soybean	*240,000 lbs.*	*0.9*	*0.403*	*13,900 lb.*	*0.0065*	*1,400 lb.*
1.						
2.						
3.						
4.						
5.						
TOTAL						

G. CHANGE IN INVENTORY (beginning vs. end of year). If the inventory of any previously mentioned crop or animal feed stored on farm has changed from the beginning to the end of the year, indicate that change in inventory below.

Crops and Feeds Stored on Farm				Nitrogen		Phosphorus	
List Crop/Feed	a. Inventory on Jan. 1 (lbs.)	b. Inventory on Dec.31 (lbs.)	c. Fraction DM [1]	d. Fraction CP	Total = (b – a) x c x d / 6.25	e. Fraction P	Total = (b – a) x c x e
Example: corn	*560,000 lb.*	*300,000 lb.*	*0.87*	*0.09*	*3,300 lb.*	*0.0031*	*720 lb. P*
1.							
2.							
3.							
TOTAL							

1 If Fraction CP and Fraction P are reported on a dry matter basis , enter fraction DM.
If Fraction CP and Fraction P are reported on a wet basis (as fed basis), enter "1" for fraction DM.
DM...Dry Matter CP...Crude Protein P...Phosphorus

III. FERTILIZER, MANURE, AND MISCELLANEOUS PRODUCTS

H. FERTILIZER INPUTS (Dry, liquid, anhydrous, compost, etc.). For a one year period, enter all fertilizer purchases from off-farm suppliers, and nitrogen and phosphorus content. If nutrient contents are unknown, use Reference Table 2. Phosphorus should be entered as %P, not $\%P_2O_5$. Convert to %P by dividing $\%\ P_2O_5$ by 2.3.

Fertilizer Inputs	a. Amount Purchased (pounds)	Nitrogen		Phosphorus	
		b. Fraction Nitrogen	Total = a x b	c. Fraction P	Total = a x c / 2.29
Example: Conc. Super-phosphate	*48,000 lb.*	*0*	*0 lb. N*	*0.2*	*4,200 lb. P*
1.					
2.					
3.					
4.					
5.					
TOTAL					

I. OUTPUTS (Manure, composts, etc.). For a one year period, list all fertilizers, manures, or other miscellaneous products sold, traded, or given away and your best estimate of quantity involved. If nutrient content is known, enter those concentrations. If unknown use Reference Table 2. Manure quantity and nutrient concentrations should be reported on a wet weight basis. Phosphorus should be entered as %P, not $\%P_2O_5$. ($\%P = \%\ P_2O_5 \div 2.3$)

Fertilizer, manure, and compost outputs	a. Amount shipped off-farm (pounds)	Nitrogen		Phosphorus	
		b. Fraction Nitrogen	Total = a x b	c. Fraction P	Total = a x c
Example: feedlot manure	*100,000*	*0.01*	*1,000 lb. N*	*0.004*	*400 lb. P*
1.					
2.					
3.					
4.					
5.					
TOTAL					

J. CHANGE IN INVENTORY (beginning vs. end of year). If the inventory of any previously mentioned product has changed from the beginning to the end of the year, indicate that change in inventory below.

Fertilizer, manure, and compost outputs	Inventory on :		Nitrogen		Phosphorus	
	a. January 1	b. December 31	c. % Nitrogen	Total = (b-a) x c/100	d. % P	Total = (b-a) x d/100
1.						
2.						
3.						
4.						
5.						
TOTAL						

IV. MISCELLANEOUS NITROGEN SOURCES

K. INPUTS AS LEGUME FIXED NITROGEN: For all legumes not manured within the past two years, indicate acres grown, yield, and crude protein (CP) content (as fed or wet basis). If CP is unknown, use Reference Table F-4.

Crop	a. Acres not manured	b. Yield	c. Fraction CP (as fed)	Total =	Assumptions: Legume Factor	Assumptions: Fixation Factor
Example: Older legume hay crop	*100*	*5 tons/ac*	*0.18*	*a x b x c x 192 = 17,300 lb. N*	*1*	*0.6*
1. 1st year hay crop (≥ 90% Legume)		tons/ac		*a x b x c x 96 =*	1	0.3
2. 2nd year or older hay crop (≥ 90% Legume)		tons/ac		*a x b x c x 192 =*	1	0.6
3. 1st year hay crop (Grass & Legume Mix: 25-90% Legume).		tons/ac		*a x b x c x 58 =*	0.6	0.3
4. 2nd year or older hay crop (Grass & Legume Mix: 25-90% Leg.)		tons/ac		*a x b x c x 115 =*	0.6	0.6
5. Soybeans		bu/ac		*a x b x c x 3.8 =*	1	0.4
6. Dry Edible Beans		bu/ac		*a x b x c x 3.8 =*	1	0.4
7.		bu/ac				
TOTAL						

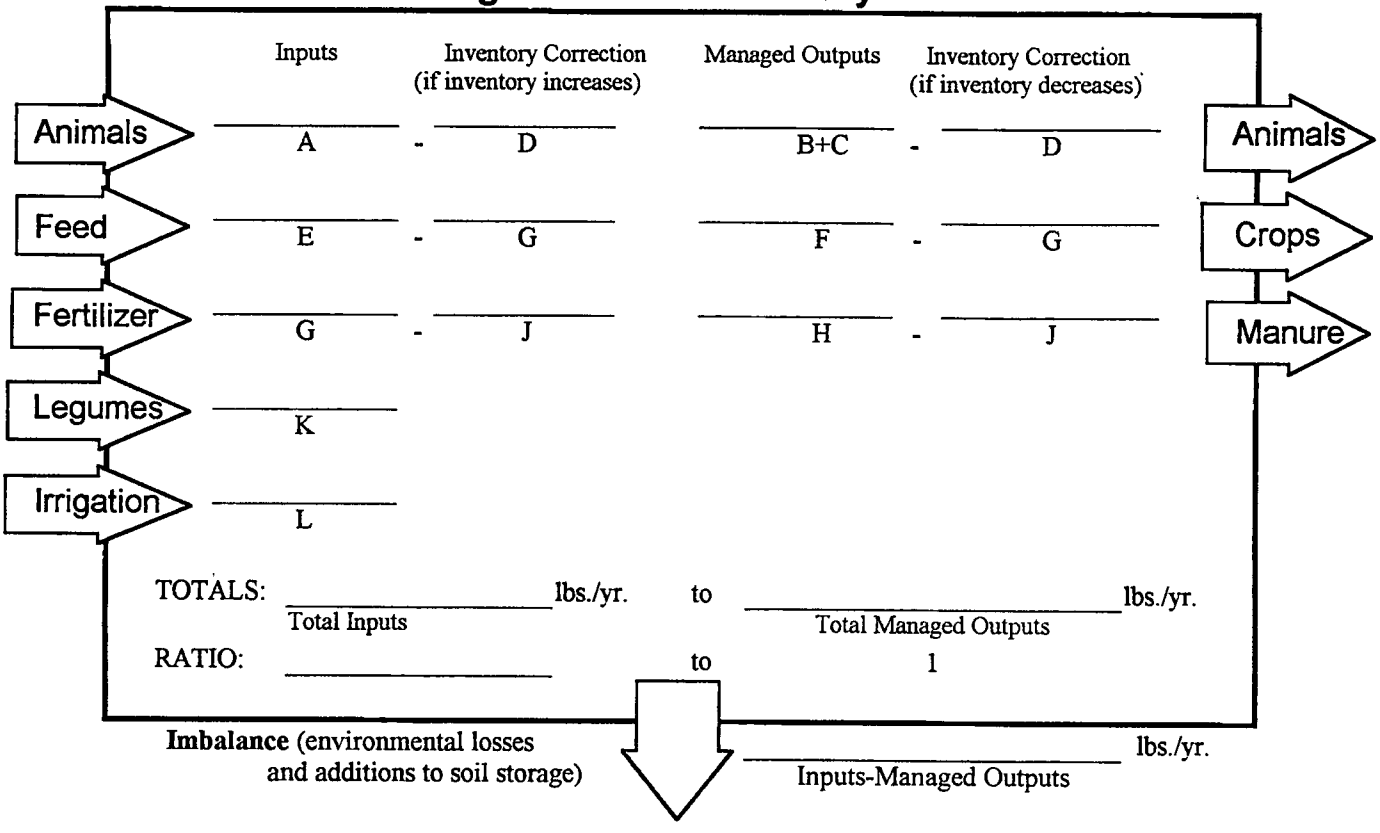
Legume Factor: Portion of harvested crop crude protein that is from legumes.
Fixation Factor: Portion of legume fixed nitrogen that originates from atmosphere.

L. INPUTS AS NITROGEN IN IRRIGATION WATER. List all irrigation wells, quantity of fresh water pumped, and nitrate-N concentration, if known. Do not include effluent from lagoon or feedlot runoff control pond.

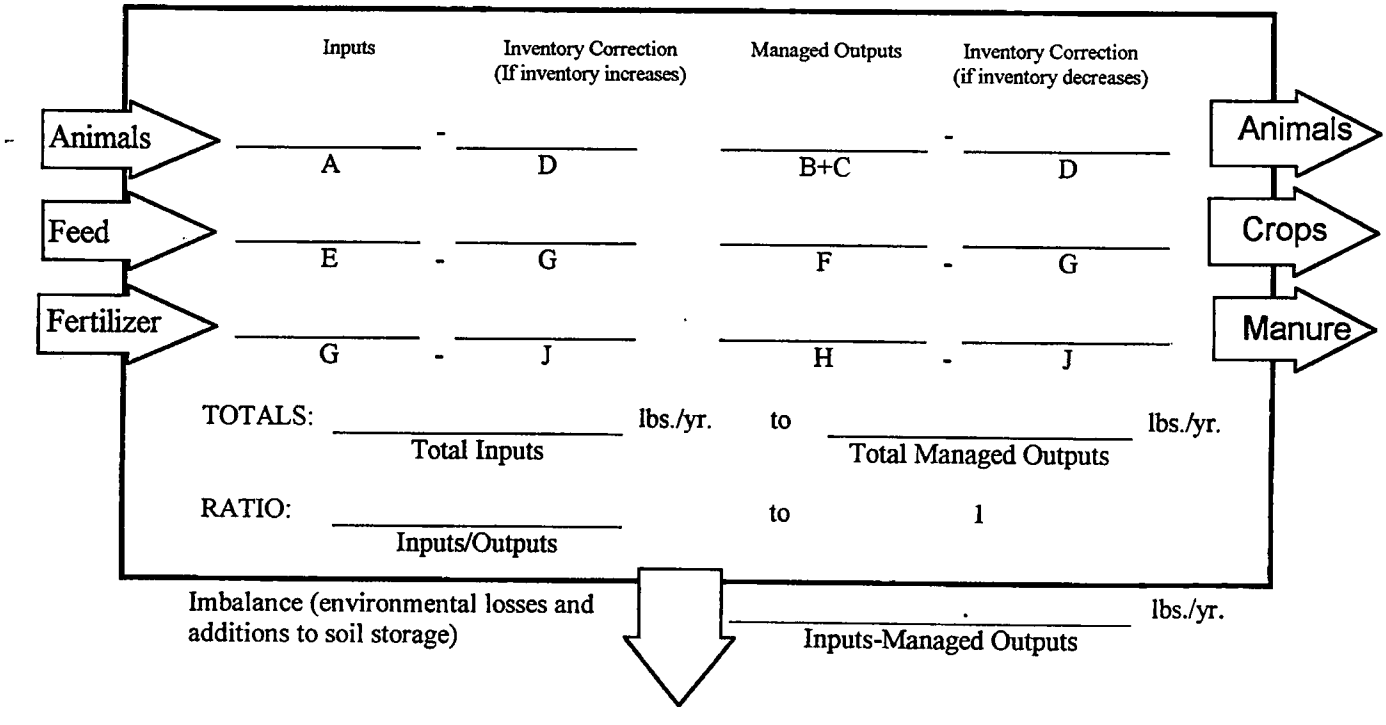
Well	a. PPM Nitrate-N	b. Acre-inches pumped	Total = a x b x 0.227
Example: Home quarter well	*15 ppm nitrate-N*	*1700 ac-in*	*5,800 lb. N*
1.			
2.			
3.			
4.			
5.			
TOTAL			

Instructions: To complete Nitrogen and Phosphorus Balance, enter inputs and output values from the previous four pages. For example, "A" refers to Livestock Inputs total from page 2-19.

M. Nitrogen Balance Summary



N. Phosphorus Balance Summary



Calculation of Land Requirements for Managing Manure

Instructions for Estimate of Nutrient Excretion (Form A)

Purpose

Forms A through F will guide calculation of an estimate of the land requirements for managing the nutrients in manure. Having access to sufficient land for utilizing the nutrients in manure is fundamental to reducing environmental risk associated with manure management.

References

NRCS Ag. Waste Mgmt. Field Handbook (chapters 4 and 11), http://www.ncg.nrcs.usda.gov/awmfh.html

Environmental Benefits: 

Instructions for Form A:

Manure Nutrient Inventory Spreadsheet, http://www.manure.unl.edu/ , completes these same calculations in an Microsoft Excel spreadsheet. The spreadsheet can be downloaded from the above web site. The following instruction define procedures if you plan to make the calculations by hand.

Step 1 Identify the manure storage system used on this livestock operation. A separate worksheet should be used for each manure handling system used in this livestock operation. For example, if the manure from the sow herd feeds an anaerobic lagoon and the manure from the grow/finish hogs is stored in a below floor pit, two separate worksheets should be used, one for the anaerobic lagoon and one for the below floor pits. The totals should be kept separate.

Step 2. Enter the required data:

Enter the following values for each group of livestock supplying manure:

- Col. b: Maximum one-time animal population.
- Col. c: The average weight per animal for each species and animal group.
- Col. e: The decimal fraction of the year the facility is occupied.

Step 3: Complete the following calculations:

- Col. d: Total Animal Weight = b x c.
- Col. g: Total nitrogen production = d x e x f.
- Col. i: Total phosphorus production (as phosphate) = d x e x h.

Step 4: Sums of nitrogen and phosphorus production. Sum manure nutrient production for all groups of animals using the same manure handing system and record it in:

- Cell j. Total nitrogen produced, and
- Cell k. Total phosphorus produced (as phosphate).

Calculation of Land Requirements for Managing Manure (continued)

Form A: Estimate of Nutrient Excretion

Manure storage system: _____

a. Livestock or Poultry Species	b. Maximum one-time capacity (# of animals)	c. Average Weight (lb./animal)	d. Total Animal Weight at Capacity (lbs.) (b x c)	e. Fraction Of Year Facility is Occupied	f. Lbs. of manure N per lb. of animal weight per year	g. Total N production lbs. N/yr. (d x e x f)	h. Lbs. of manure P_2O_5 / lb. of animal weight per year	i. Total P_2O_5 production lbs. P_2O_5 /yr. (d x e x h)
Example : Swine...Finish	2000	150	300,000	0.97	0.15	43,700	0.13	37,800
Swine Nursery					0.22		0.21	
Grow					0.15		0.13	
Finish					0.15		0.13	
Sows & Litter					0.17		0.12	
Sows (Gestation)					0.07		0.05	
Gilts					0.088		0.066	
Boars					0.055		0.042	
Beef (450-750 lb.)					0.11		0.083	
Beef feeder (high energy diet)					0.11		0.078	
Beef feeder (high forage diet)					0.11		0.091	
Beef Cow					0.12		0.10	
Dairy Cow...50 lb./d					0.18		0.087	
Dairy Cow...70 lb./d					0.22		0.096	
Dairy Cow...100 lb./d					0.27		0.110	
Dry Cow					0.11		0.074	
Heifer/Calves					0.11		0.033	
Layer					0.30		0.26	
Pullet					0.23		0.20	
Broiler					0.40		0.28	
Turkey					0.27		0.23	
TOTALS:					j. Total N production : lbs. N/yr.		k. Total P_2O_5 production : lbs. P_2O_5 /yr.	

Source: *NRCS Agricultural Waste Management Handbook*, 4/92 with exception of dairy lactating and dry cows. Dairy estimates are from *H.H. Van Horn.* 1991. Achieving environmental balance of nutrient flow through animal production systems. *The Professional Animal Scientist.* 7:3:22-33

Calculation of Land Requirements for Managing Manure (continued)

Instructions for Nutrients after Storage Losses (Form B)

Purpose

Forms A through F will guide calculation of an estimate of the land requirements for managing the nutrients in manure. Having access to sufficient land for utilizing the nutrients in manure is fundamental to reducing environmental risk associated with manure management. Form B guides an estimate of the quantity of nutrients remaining after losses from manure storage.

References

NRCS Ag. Waste Mgmt. Field Handbook (chapters 11), http://www.ncg.nrcs.usda.gov/awmfh.html.

Instructions

Manure Nutrient Inventory Spreadsheet, http://www.manure.unl.edu/ , completes these same calculations in an Microsoft Excel spreadsheet. The spreadsheet can be downloaded from the above web site. The following instruction define procedures if you plan to make the calculations by hand.

Nitrogen and phosphorus is lost during the storage or treatment phases of manure handling. Form B allows one to develop a "ballpark" estimate of the nutrients remaining after storage losses. The producer must identify the manure storage or treatment system that most closely approximates their own manure management facility, transfer the nutrient production numbers from Form A, and complete the appropriate calculations.

Step 1 Identify the manure storage system(s) used in this livestock operation from the listing in the left hand column (column a).

Step 2. Enter required data for each manure storage system. The user must enter the following values:

- Col. b: Total nitrogen excretion by livestock from Form A, col. b.
- Col. e: Total phosphorus (as P_2O_5) excretion by livestock from Form A, col. c.

Step 3: Complete the following calculations.

- Col. d: Available nitrogen after loses = column b x column c
- Col. g: Available phosphorus (as P_2O_5) after loses = column e x column f

Note: The multiplication factor is the portion of nutrients retained in the manure. Most lost N volatilizes into the air as ammonia, and lost phosphorus settles as solids in the lagoon bottom or is lost as runoff from an open lot. Actual losses from individual situations may vary substantially.

Calculation of Land Requirements for Managing Manure (continued)

Form B. Nutrients after Storage Losses

a. Manure Storage or Treatment System	Nitrogen			P_2O_5		
	b. Total N Excretion (Form B-6) (lbs. N/yr.)	c. Multpli-cation Factor	d. Available N After Losses (lb. N/yr.)	e. Total P_2O_5 Excretion (Form B-6) (lb. P_2O_5/yr.)	f. Multpli-cation Factor	g. Available P_2O_5 After Losses (lb. P_2O_5/yr.)
Example: 1. Storage (liquid manure, top loaded storage)	45,000	X 0.70 =	31,500	39,000	X 1.0 =	39,000
1. Open lot or feedlot (scraped feedlot)		X 0.6 =			X 0.95 =	
2. Open lot or feedlot runoff		X 0.05 =			X 0.05 =	
3. Manure pack under roof		X 0.70 =			X 1.0 =	
4. Bedded pack for swine. (e.g. hoop building) [1]		X 0.50 =			X 1.0 =	
5. Bedded pack & compost for swine. (e.g. hoop building) [1]		X 0.35 =			X 1.0 =	
6. Solid/semi-solid manure & bedding held in roofed storage		X 0.75 =			X 1.0 =	
7. Solid/semi-solid manure & bedding held in unroofed storage		X 0.65 =			X 0.95 =	
8. Liquid/slurry storage in covered storage		X 0.90 =			X 1.0 =	
9. Liquid/slurry storage in uncovered storage		X 0.75 =			X 1.0 =	
10. Storage (pit beneath slatted floor)		X 0.85 =			X 1.0 =	
11. Poultry manure stored in pit beneath slatted floor		X 0.85 =			X 1.0 =	
12. Poultry manure on shavings or sawdust held in housing		X 0.70 =			X 1.0 =	
13. Compost		X 0.70 =			X 0.95 =	
14. 1-Cell anaerobic treatment lagoon		X 0.20 =			X 0.35 =	
15. Multi-cell anaerobic treatment lagoon [1]		X 0.10 =			X 0.35 =	
16. Other:		X =			X =	

Instructions for Nitrogen Available after Land Application Losses (Form C)

Purpose

Forms A through F will guide calculation of an estimate of the land requirements for managing the nutrients in manure. Having access to sufficient land for utilizing the nutrients in manure is fundamental to reducing environmental risk associated with manure management The purpose of Form C is to estimate the quantity of nutrients remaining after losses during manure application.

References

NRCS Ag. Waste Mgmt. Field Handbook (chapters 11), http://www.ncg.nrcs.usda.gov/awmfh.html

Instructions:

Manure Nutrient Inventory Spreadsheet, http://www.manure.unl.edu/ , completes these same calculations in an Microsoft Excel spreadsheet. The spreadsheet can be downloaded from the above web site. The following instruction define procedures if you plan to make the calculations by hand.

Volatilization of ammonia and slow mineralization of organic nitrogen reduces the availability of manure nitrogen to the crop. Form C and the supporting table of nitrogen availability factors can be used to estimate crop available nitrogen from total available nitrogen after storage losses. The outcome of Form C is the total crop available manure nitrogen that must be managed in crop production systems.

Col. a: Identify a manure storage and treatment system used on this livestock operation from the listing in Form B (column a) for which available nutrient calculations were completed. Space is available for identifying three manure storage and treatment systems.

Col. b: Record the available nitrogen after manure storage losses from Form B, column d, into column b of Form C.

Col. c: Identify the application method and manure source that most closely approximates the manure management system used on your farm (see reference table for choices and enter selection into column c). More than one application method may be used for the manure from a single manure storage and treatment system.

Col. d: Fraction applied by this method. For example, you may broadcast 1/3 of your manure without incorporation and broadcast and incorporate the remaining 2/3 within one day. Enter it in decimal form.

Col. e: Calculate the remaining N after land application (column d) for the selected application methods. Available nitrogen after land application losses = column b x column c x column d

Cell g: Sum the total nitrogen available by summing values in column e and recording it in cell f.

Calculation of Land Requirements for Managing Manure (continued)

Form C. Nitrogen Available after Land Application Losses

a. Manure Storage Source and Application Method	b. Available nitrogen after storage/treatment losses. (value from Form D)	c. Fraction of nitrogen remaining after land application (see reference table below)	d. Fraction of manure land applied by this application method.	e. Potential nitrogen available after storage and land application losses.* Total = b X c X d
1.				
2.				
3.				
4.				
Total				f.

* Potential nitrogen available after accounting for ammonia volatilization and mineralization rate following land application. For planning such as estimating land requirements for manure utilization, it is typically assumed that all of the phosphorus and potassium will be available. Only nitrogen is lost in significant quantities through volatilization or leaching.

Reference Table 1. Livestock manure nutrient first-year availability coefficients.

Type of Manure	Application Method								
	Soil incorporation			Broadcast			Irrigation		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	
Scraped manure									
Dairy	0.6	0.8	1.0	0.5	0.7	0.9	*	*	*
Beef	0.6	0.8	1.0	0.5	0.7	0.9	*	*	*
Swine	0.6	0.8	1.0	0.5	0.7	0.9	*	*	*
Sheep/Goat	0.6	0.8	1.0	0.5	0.7	0.9	*	*	*
Horse, stable	0.5	0.8	1.0	0.5	0.7	0.9	*	*	*
Poultry House Litter									
All poultry litters	0.6	0.8	1.0	0.5	0.7	0.9	*	*	*
Liquid manure slurry									
Dairy	0.7	0.8	1.0	0.5	0.7	1.0	0.4	0.7	1.0
Beef	0.7	0.8	1.0	0.5	0.7	1.0	0.4	0.7	1.0
Swine	0.7	0.8	1.0	0.4	0.7	1.0	0.3	0.7	1.0
Layer	0.7	0.8	1.0	0.5	0.7	1.0	0.4	0.7	1.0
Anaerobic lagoon liquid									
Dairy	0.8	0.9	1.0	0.5	0.8	1.0	0.5	0.8	1.0
Beef	0.8	0.9	1.0	0.5	0.8	1.0	0.5	0.8	1.0
Swine	0.9	0.9	1.0	0.5	0.8	1.0	0.5	0.8	1.0
Layer	0.9	0.9	1.0	0.5	0.8	1.0	0.5	0.8	1.0

*Not applicable

Calculation of Land Requirements for Managing Manure (continued)

Instructions for Estimating Manure Nitrogen Land Requirements (Form D)

Purpose

Forms A through F will guide calculation of an estimate of the land requirements for managing the nutrients in manure. Having access to sufficient land for utilizing the nutrients in manure is fundamental to reducing environmental risk associated with manure management The purpose of Form D is to estimate if sufficient land for utilizing the nitrogen in manure at agronomic rates.

THIS PROCESS IS NOT INTENDED FOR MAKING CROP NUTRIENT APPLICATION RECOMMENDATIONS OR DEVELOPING AN ANNUAL NUTRIENT MANAGEMENT PLAN.

References

NRCS Ag. Waste Mgmt. Field Handbook (chapters 11), http://www.ncg.nrcs.usda.gov/awmfh.html

Instructions:

Manure Nutrient Inventory Spreadsheet, http://www.manure.unl.edu/ , completes these same calculations in an Microsoft Excel spreadsheet. The spreadsheet can be downloaded from the above web site. The following instruction define procedures if you plan to make the calculations by hand.

Nitrogen utilization by cropping systems are compared to the available manure nutrients after losses to determine if sufficient land is available for agronomic application of manure nitrogen. Typical cropping programs, yields, and crop nitrogen requirements are entered for individual fields available for land application. The nutrient requirements of an individual fields are subtracted from the previous estimates of available manure nitrogen. This process is repeated until sufficient fields are identified to utilize all manure nitrogen.

Step 1 Enter required information including:

Cell a: Total available manure nitrogen from Form C.
Col. b: Field or management area ID for fields to be used for manure application.
Col. c: Size of individual fields in acres.
Col. d: Crop grown for a typical year. Acres for individual crops should match a typical rotation,
Col. e: Expected yield. Enter the five year historical average (excluding years with unusual stress) plus 5%. Units: bu./ac., tons/ac., lb./ac.
Col. f: Crop Nitrogen Requirement. Look up crop nitrogen removal rates from Reference Table ?. Using crop removal rates may underestimate N needs by corn, sorghum, and small grains.
Col. g: Sum of all non-manure nitrogen credits not accounted for in the value in col. f (e.g. legumes, residual soil nitrate, irrigation water nitrates) and planned commercial fertilizer application.

Step 2: Complete the following calculation.

Col. h: Manure nitrogen requirement per acre = column f - column g
Col. i: Manure nitrogen use by field = column c x column h
Col. j: Remaining manure nitrogen to be used by other fields = cell a - column i (for first field entry)
For all remaining fields, column j = column j for previous field - column i for current field.

Step 3: Enter additional fields and repeat calculations until Remaining Manure Nitrogen (column j) is 0. If some manure nitrogen is left over after all available fields have been utilized, then either arrange for additional land area for manure application or consider transferring manure nutrients to off-farm customers.

Calculation of Land Requirements for Managing Manure (continued)

Form D. Manure Nitrogen Land Requirements

a. Total Available Manure Nitrogen (Form B-8, cell g) = lbs. N/yr.(a)
Example: 57,000 lb. N/yr.

b. Field ID	c. Acres	d. Crop	e. Expected Yield units	f. Crop Nitrogen Requirement (lb. N/ac.) [1]	g. Nitrogen Credits (lbs. N/ac.)	h. Manure-N Requirement (f – g) (lb. N/ac.)	i. Manure-N Use by Field (c X h) (lbs. N/field)	j. Remaining Manure N (a - i) (lbs./yr.) (j above - i)
Example	160	Corn	170 bu/ac.	150 lb./acre	30 lb./ac.	120 lb./ac	19,200 lbs.	37,800 lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.

For the example, Crop N removal equals 170 bu./ac. times 0.9 lb. N /bu. (from Reference Table 4) or 153 lbs. of N/acre. Use of removal rates actually will underestimate nitrogen requirements for non-legume crops and further contribute to a conservative estimate of land requirements based upon manure nitrogen.

Calculation of Land Requirements for Managing Manure (continued)

Instructions for Manure Phosphorus Land Requirements (Form E)

Purpose

Forms A through F will guide calculation of an estimate of the land requirements for managing the nutrients in manure. Having access to sufficient land for utilizing the nutrients in manure is fundamental to reducing environmental risk associated with manure management. The purpose of Form E is to estimate if sufficient land for utilizing the phosphorus in manure at agronomic rates.

THIS PROCESS IS NOT INTENDED FOR MAKING CROP NUTRIENT APPLICATION RECOMMENDATIONS OR DEVELOPING AN ANNUAL NUTRIENT MANAGEMENT PLAN.

References

NRCS Ag. Waste Mgmt. Field Handbook (chapters 11), http://www.ncg.nrcs.usda.gov/awmfh.html

Instructions

Manure Nutrient Inventory Spreadsheet, http://www.manure.unl.edu/ , completes these same calculations in an Microsoft Excel spreadsheet. The spreadsheet can be downloaded from the above web site. The following instruction define procedures if you plan to make the calculations by hand.

Phosphorus utilization by cropping systems are compared to the available manure nutrients after losses to determine if sufficient land is available for agronomic application of manure phosphorus. Typical cropping programs, yields, and crop phosphorus requirements are entered for individual fields available for land application. The nutrient requirements of an individual field are subtracted from the previous estimates of available manure phosphorus. This process is repeated until sufficient fields are identified to utilize all manure phosphorus.

Step 1 Enter required information including:

Cell a: Total available manure phosphorus from Form B, col. g, All column g entries will need to be added.
Col. b: Field or management area ID for fields to be used for manure application.
Col. c: Size of individual fields in acres.
Col. d: Crop grown for a typical year. Acres for individual crops should match a typical rotation,
Col. e: Expected yield. Enter the five year historical average (excluding years with unusual stress) plus 5%. Units: bu./ac., tons/ac., lb./ac.
Col. f: Crop Phosphorus Requirement. This should be based upon historical soil tests and recommendations. If this information is not available, an alternative is to use crop phosphorus removal rates from Reference Table ?. Using crop removal rates may significantly underestimate or overestimate phosphorus needs in parts of many fields.
Col. g: Sum of all non-manure phosphorus credits or planned commercial fertilizer application.

Step 2: Complete the following calculation.

Col. h: Manure phosphorus requirement per acre = column f - column g
Col. i: Manure phosphorus use by field = column c x column h
Col. j: Remaining manure phosphorus to be used by other fields = cell a - column i (for first field entry)
For all remaining fields, column j = column j for previous field - column i for current field.

Step 3: Enter additional fields and repeat calculations until Remaining Manure Phosphorus (column j) is 0. If some manure phosphorus is left over after all available fields have been utilized, then either arrange for additional land area to transfer manure nutrients to off-farm customers.

Calculation of Land Requirements for Managing Manure (continued)

Form E. Instructions for Manure Phosphorus Land Requirements

Available Manure Phosphorus (Form C, column g) = ______ lbs. P_2O_5 (a)

Example: 27,000 lb./year

b. Field ID	c. Acres	d. Crop	e. Expected Yield units	f. Crop P_2O_5 Requirement[1] (lbs./acre)	g. P_2O_5 Credits (lbs./ac.)	h. Manure P_2O_5 Requirement (f – g) (lbs./acre)	i. Manure P_2O_5 Use by Field (c x h) (lbs./field)	j. Remaining Manure P_2O_5 (a-i) (lbs./year) (j above - i)
Example	160	Corn	170 bu./ac	61 lb./acre	0 lb./acre	61 lb./acre	9,760 lbs.	17,240 lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.
				lbs./acre	lbs./acre	lbs./acre	lbs.	lbs.

1. For the corn example, Crop P Removal equals 170 bu./ac. times 0.36 lb. P_2O_5 / bu. (from Reference Table F-1) or 61 lbs. of P_2O_5/acre.

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing worksheets, identify the strengths and weaknesses of you system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Goals or Changes	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	
Long Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	

Identification of Strengths, Weaknesses, & Priorities (continued)

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

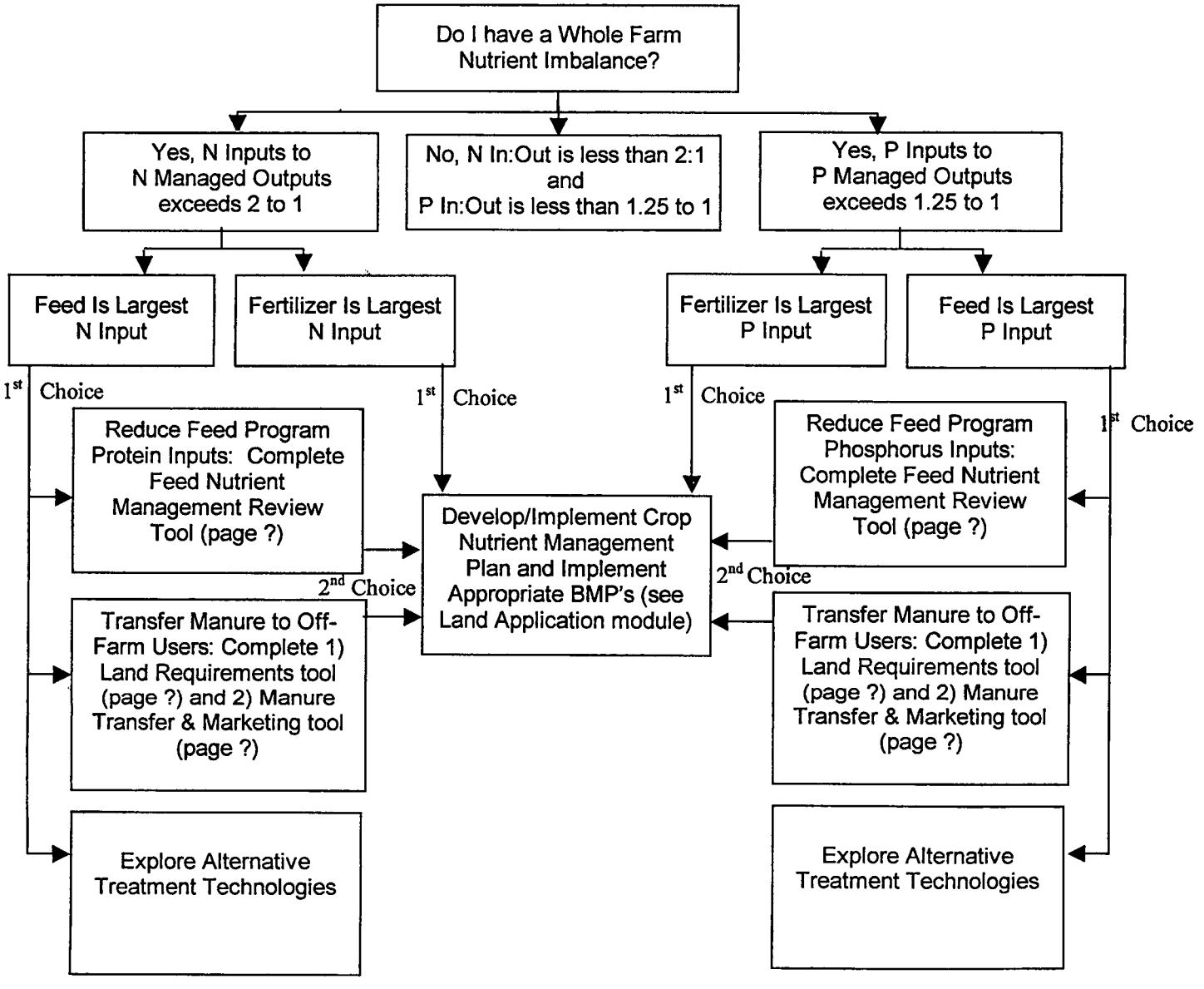
Activities	Years in Which Significant Progress is Made Towards Goal?	Year in Which Goal is Accomplished?
Short Term Goals or Changes		
1. _____		
_____		
2. _____		
_____		
3. _____		
_____		
Long Term Goals or Changes		
1. _____		
_____		
2. _____		
_____		
3. _____		
_____		

Review of Options: Decision Tree for Selecting Nutrient Management Strategies Based Upon Whole Farm Nutrient Balance

Four alternative nutrient strategies are available for addressing a nutrient imbalance or concentration within your livestock or poultry operation. They include:

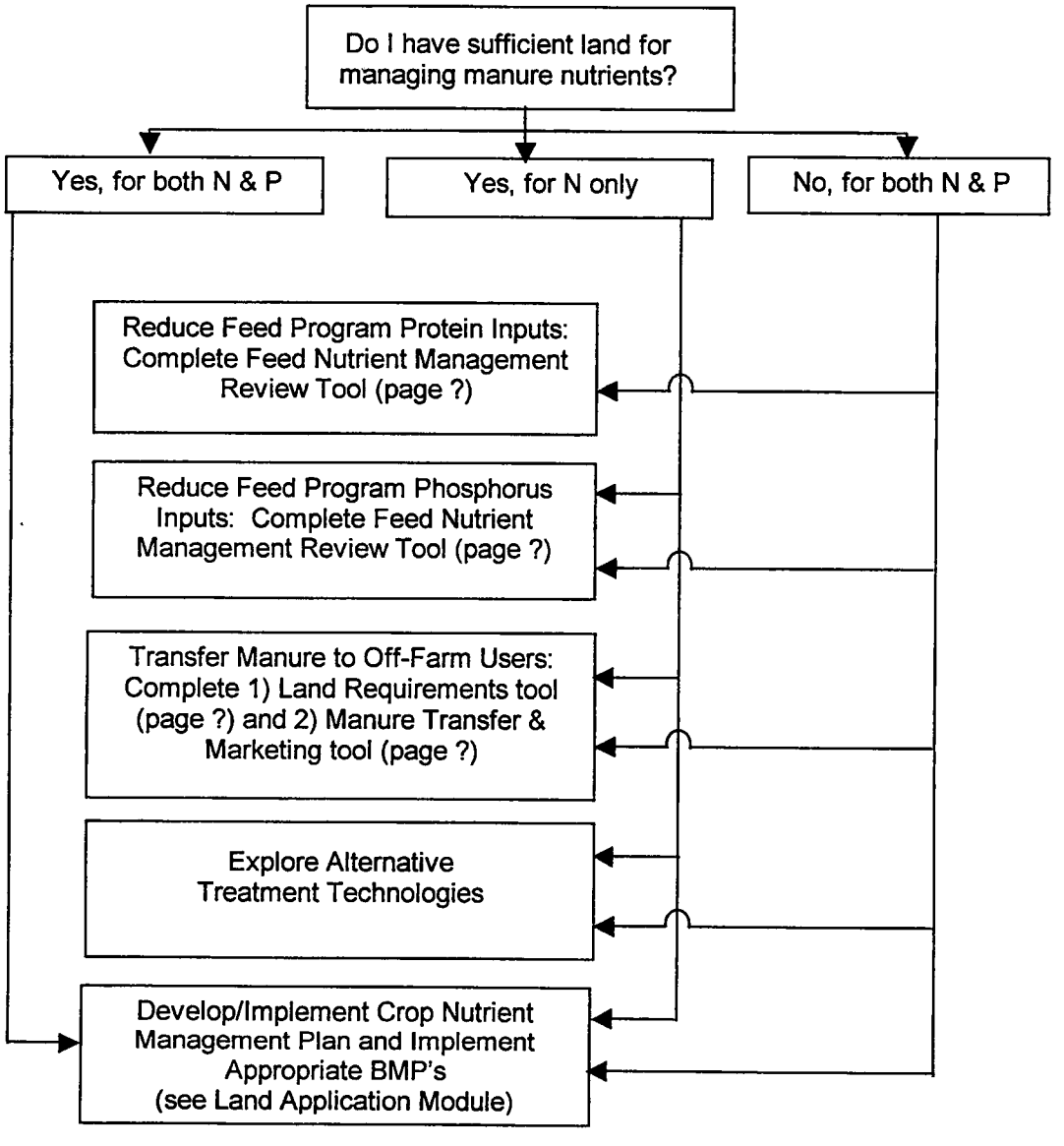
1. Efficient use of manure nutrients in crop production for reduce commercial fertilizer inputs..
2. Alternative livestock feeding programs to reduce purchased feed inputs.
3. Transfer of manure nutrients to off-farm users to increase managed nutrient outputs.
4. Alternative manure treatment systems to enhance transfer of manure to off-farm users or allow disposal of manure nutrients without environmental risk.

Based upon the relative magnitude of different nutrient inputs when compared to an observed imbalance, one or more strategies may be preferred for achieving an acceptable balance. The following decision trip may assist in identifying the preferred nutrient management strategies.



Review of Options: Decision Tree for Selecting Nutrient Management Strategies Based Upon Accessible Land for Managing Manure Nutrients

A review of land requirements provides an indication of concentration of nutrients when accessible land does not provide the opportunity for agronomic utilization of manure nutrients. However, this tool does not provide guidance as to the best nutrient management strategy for addressing a shortage of accessible land.



Review of Options: Management of Feed Nutrients (Dairy)

Purpose:
Apply sound animal feeding and husbandry practices to achieve targeted levels of production and minimal excretion of nutrients in manure.

Effective management of nutrients is a primary goal of Comprehensive Nutrient Management Plans (CNMPs). These plans aim to reduce a livestock farm's risk of discharging nutrients to surface and ground waters. Although feeding management adjustments are not always components of CNMPs, changes in the feeding program can have significant influence on farm nutrient management. Generally, more than two-thirds of the nutrients annually delivered to livestock farms are in the form of imported or purchased feeds. Farms that intensively manage their feeding program, reduce nutrient excretion in the manure, increase feed nutrient utilization and subsequently improve production and the farm's whole farm nutrient balances.

From an environmental perspective, three areas of feed management significantly influence effective feed nutrient use:

1. Digestible nutrient content of homegrown forages produced and fed,
2. Accuracy of estimating feed nutrient intakes, and
3. Employment of scientific standards to determine nutrient requirements and ration levels.

Digestibility of nutrients in a forage, commonly referred to as forage quality, determines the amount of that forage cattle will consume. The greater the quality of homegrown forages produced and fed, the less purchased feeds must be imported to achieve production. Maximizing the feeding of homegrown forages more effectively recycles nutrients from the crop, to the cow, to the manure, to the soils and back to the crop.

Inaccurate estimates of feed consumption can lead to large imbalances in nutrient intake, ineffective rumen digestion and reduced lower tract absorption. Packaging the nutrients required for animal maintenance, growth, production and reproduction within the meal size the animals are actually eating is a critical component of ration balancing. Rations regularly balanced to supply required nutrients will result in high production and a smaller proportion of feed nutrients excreted in the manure.

General animal husbandry is also critical to insure effective feed nutrient utilization. A feeding program will best perform when animals are kept healthy, comfortable, and housed in a stress-free environment. Furthermore, clean, fresh feed and water must be readily available to achieve maximum feed intake and the projected level of milk or meat production.

Glossary:
Digestibility—Percentage of feed or a feed nutrient that is absorbed through the digestive tract. It can be calculated as: [(lbs. nutrient intake – lbs. nutrient in feces) ÷ lbs. nutrient intake] X 100%.

Dry Matter Content—Also expressed as Percent (%) Dry Matter, the portion of a feed remaining after all the water is driven off. It is this portion that contains all the nutrients for which a ration is balanced.

Dry Matter Intake—Amount of feed dry matter content a cow will voluntarily eat in a day. The larger the dry matter intake, the lower the percentage of nutrients are required to supply the daily requirements.

Dry Period—Period of time in which a cow is not giving milk. Prior to calving, a mammary gland requires a period of rest in which old lactating tissue is reabsorbed and new milk secreting tissue replaces it. Without the dry period, the gland will not produce to its potential.

Forages—Feed containing the vegetative parts of a plant. Haycrop forages (i.e. alfalfa hay or silage) do not contain any grains, while grain crop forages (i.e. corn silage) contain both vegetative and grain portions of the plant. Cattle feeds are generally classified into forages or concentrates (grains).

Forage Quality—A qualitative measure of the nutritive value and digestibility of a forage. It is best quantified by measuring the structural fibers of the feed.

NDF (Neutral detergent fiber)—In the laboratory, the residual after digesting a sample of feed in a neutral detergent solution. It contains the structural fiber component (cellulose, hemicellulose and lignin) of plant cell walls. It is closely related to the amount of a forage a cow will voluntarily eat.

NRC—National Research Council, scientific body that sets nutritional standards for feeding animals in the US.

Rumen Degradable Protein—Fraction of protein sources that supply peptides, amino acids and ammonia for rumen microbial growth.

Rumen Undegradable Protein—Fraction of protein sources that essentially escape digestion in the rumen and deliver intact protein to the lower digestive tract.

"Wet" feeds—Forages, grains, or by-product feeds generally with less than 87% dry matter such that moisture content can significantly vary over time or between batches (i.e. Ensiled forages, high moisture corn, wet brewer's grains).

Wet chemistry—Complete chemical analysis of feeds to quantify nutrients or minerals in feeds. Two methods of feed analysis are available from most labs, wet chemistry and near-infrared refractance (NIR). Wet chemistry is more accurate for mineral analysis of feeds.

Draft 1, 5/23/01

Review of Options: Management of Feed Nutrients (Dairy)

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

The following assessment tool was adapted from the Guide to Agricultural Environmental Management in New York State, Second Edition, 2001. Department of Agriculture & Markets, Albany, NY.

Issue	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefit
	Nutrient Concentration in Diet				
Dairy cows: high producing group	16% Crude Protein 0.4% Phosphorus	17% 0.5%	18% 0.5%	19% 0.6%	20% 0.6%	N, NH_3, O, P
Dairy cows: low producing group	13% Crude Protein 0.30% Phosphorus	14% 0.40%	15% 0.40%	16% 0.50%	17% 0.50%	N, NH_3, O, P
Dairy cows: dry	11% Crude Protein 0.10% Phosphorus	12% 0.20%	13% 0.20%	14% 0.30%	15% 0.30%	N, NH_3, O, P

Review of Options:
Management of Feed Nutrients (Dairy...continued)

Issue	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefit
What is the quality of the homegrown haycrop forages?	More than two-thirds of haycrop produced have NDF levels: <=60% (grass) <=45% (legumes).	More than half of haycrop produced have NDF levels: <=60% (grass) <=45% (legumes).		More than half of haycrop produced have NDF levels: >=60% (grass) >=45% (legumes).	
How much homegrown forages are being fed? (**Lactating dairy herds only**. See last sheet for example calculations)	Homegrown forage dry matter fed is greater than 2.2% of the average herd body weight.	Homegrown forage dry matter fed is between 2.0 and 2.2% of the average herd body weight.	Homegrown forage dry matter fed is between 1.8 and 2.0% of the average herd body weight.	Homegrown forage dry matter fed is less than 1.8% of the average herd body weight.	
How is dry matter intake for various groups of cattle determined?	Reliably measured by weighing amounts fed and feed refused; AND Cattle are consuming appropriate amounts.	Reliably estimated by weighing amounts fed and estimating feed refused; AND Cattle are consuming appropriate levels.	Reliably estimated by weighing amounts fed and estimating feed refused AND Cattle are **not** consuming appropriate amounts.	Book values for dry matter intake are used to balance rations and amounts fed or refused are not weighed.	N NH_3 P O
How often is dry matter intake measured or estimated.	Weekly	Every 2 weeks	Monthly	Infrequently	
How often are feeds analyzed for nutrient and dry matter content?	Feeds are analyzed for nutrient content at least monthly AND Dry matter content of "wet" feeds is determined weekly on the farm.	Feeds are analyzed for nutrient content at least monthly AND Dry matter content of "wet" feeds is determined less than weekly on the farm.	Feeds are analyzed for nutrient content only when a new feed or forage crop is fed OR On-farm forage dry matter determination of "wet" feeds is not practiced.	Feeds are not regularly analyzed.	
How often are rations balanced?	Rations are balanced more than six times a year. OR When changes in feed quality are anticipated.	Rations are balanced when a change in production or feed is noticed.		No systematic or regular ration balancing is practiced.	

Review of Options:
Management of Feed Nutrients (Dairy...Continued)

Issue	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefit
How is protein balanced in rations?	Protein levels are fed at NRC recommendation AND Balanced for rumen-degradable and undegradable protein fractions AND A program that models rumen carbohydrate and protein interactions is used.	Protein levels fed at NRC recommendation AND Balanced for rumen-degradable and undegradable protein fractions.	Protein levels fed at NRC recommendation.	Protein fed in excess or below recommended levels OR Protein levels fed are not reliably known.	N NH_3 O
How are phosphorus (P) and potassium (K) levels in rations determined?	P and K levels are fed at NRC recommendations AND Low K forages are fed to dry cows.	P and K levels are fed at NRC recommendations.	P and K fed in excess or below recommended levels.	P and K levels fed are not reliably known.	P

ADDITIONAL INFORMATION:

Herd Health and Performance Issues:

Is the herd on a regular health program with a local veterinarian?

Is the incidence of calving difficulties or post-calving disorders (ketosis, milk fever, retained placenta, displaced abomasum or mastitis) less than 5% in the herd?

Are cattle growing and producing up to industry standards or producer's expectations?

For milking cows, are adequate dry periods allowed? (First calf heifers at least 55 days; older cows at least 45 days)

Does the herd show signs of lameness, abnormal hoof growth, or other foot problems?

Cow Comfort and Housing Stress Issues:

Are stalls of proper design, adequate size and in good repair?

Are animal beds/packs clean and dry with plenty of bedding?

Do animals show signs of bruising of hocks, thurls or around shoulders or pinbones?

Is there adequate watering and feeding space for animals?

Are barns adequately ventilated with no detectable drafts or stale air?

General Nutrition and Feeding Issues:

Do high-producing dairy cows have access to feed at least 20 hours a day?

Are feedbunks cleaned daily to avoid fouling of fresh feed?

Is fresh clean water readily available to animals?

Is the herd adequately grouped and fed by production or nutritional needs?

Is wet chemistry used to determine mineral analysis of feeds?

Calculating Homegrown Forage Dry Matter Fed as a Percent of Average Herd Bodyweight

Information Needed:

Total amount of each forage fed to lactating herd **(lbs. For_n)**
Dry matter content of each forage fed **(%DM_n)**
Percentage estimate of annual needs of each forage produced on farm **(%$Homegrown_n$)**
Average herd bodyweight **(Herd Bdwt)**

Equation: $\Sigma[[(\text{lbs. } For_n) \text{ X } (\%DM_n) \text{ X } (\%Homegrown_n)] \div [(\text{Herd Size X HerdBdwt})]] \text{ X } 100\%$

Where "n" defines each forage fed to the lactating herd.
If average herd bodyweight is unknown, use 1400 for large Holstein, 1300 for small Holstein, 1200 for Guernsey and Brown Swiss, and 1000 for Jersey herds.

Example: A 95-cow Holstein herd is grouped by production and fed forages according to table below: The average herd bodyweight is 1350 lbs.

	Pounds As Fed per Production Group			
Feed	High Group	Low Group	% Dry Matter	% Homegrown
Corn Silage	2150	2350	34%	100%
Alfalfa Haylage	1185	975	41%	90%
Mixed Grass Hay	0	450	88%	70%

Pounds Homegrown Forage Dry Matter Fed as a Percent of Average Herd Bodyweight

Corn Silage [[(2150 + 2350) X 0.34 X 1.00] ÷ [(95 X 1350)]] X 100 = 1.19%
Alfalfa Haylage [(1185 + 975) X 0.41 X 0.90] ÷ [(95 X 1350)]] X 100 = 0.62%
Mixed Grass Hay [[(0 + 450) X 0.88 X 0.70] ÷ [(95 X 1350)]] X 100 = 0.21%

Pounds Homegrown Forage Dry Matter Fed/Cow 2.02%

This would be considered #2 level of potential concern for amount of homegrown forage feeding.

Note: Since a herd ration generally changes many times over the year, it is best to calculate this parameter periodically.

Review of Options:
Management of Feed Nutrients (beef finishing)

Issue	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefit

Not yet available

Environmental Stewardship Assessment for Poultry Rations

For each poultry group that applies in the left column of the worksheet, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefit
	Nutrient Concentration in Diet				
Turkeys Starter 1 (0-2wk):	26% Crude Protein 0.5% Available Phosphorus	27% 0.6%	29% 0.8%		N, NH_3, O, P
Starter 2 (3-6wk):	24% Crude Protein 0.4% Available Phosphorus	26% 0.5%	28% 0.76%		N, NH_3, O, P
Grower 1 (7-9wk):	21% Crude Protein 0.32% Available Phosphorus	23% 0.42%	25% 0.73%		N, NH_3, O, P
Grower 2 (10-12wk):	18% Crude Protein 0.28% Available Phosphorus	21% 0.38%	23% 0.69%		N, NH_3, O, P

Environmental Stewardship Assessment for Poultry Diets (continued)

For each poultry group that applies in the left column of the worksheet, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefits
	Nutrient Concentration in Diet (continued)				
Turkeys (continued) Developer (13-16wk):	15% Crude Protein 0.22% Available Phosphorus	17% 0.32%	19% 0.62%		N, NH_3, O P
Finisher (17wk-end):	13% Crude Protein 0.18% Available Phosphorus	14% 0.28%	15% 0.57%		N, NH_3, O P

Environmental Stewardship Assessment for Poultry Diets (continued)

For each poultry group that applies in the left column, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefits
	Nutrient Concentration in Diet (continued)				
Broilers starter:	21% Crude Protein	22%		23%	N NH_3 O
	0.35% Available Phosphorus	0.45%		0.5%	P
grower:	18% Crude Protein	19%		20%	N NH_3 O
	0.25% Available Phosphorus	0.35%		0.4%	P
finisher:	16% Crude Protein	17%		18%	N NH_3 O
	0.15% Available Phosphorus	0.3%		0.35%	P

Environmental Stewardship Assessment for Poultry Diets (continued)

For each poultry group that applies in the left column, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefits
	Nutrient Concentration in Diet (continued)				
Layers peaking:	18% Crude Protein	19%		20%	N NH_3 O
	0.21% Available Phosphorus	0.31%		0.41%	P
middle lay:	15% Crude Protein	16		17%	N NH_3 O
	0.15% Available Phosphorus	0.25%		0.4%	P
late lay:	12% Crude Protein	13%		14%	N NH_3 O
	0.11% Available Phosphorus	0.21%		0.31%	P

Environmental Stewardship Assessment for Poultry Diets (continued)

For each poultry group that applies in the left column, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefits
	Nutrient Concentration in Diet (continued)				
Pullets starter:	16% Crude Protein	17%		23%	N NH_3 O
	0.35% Available Phosphorus	0.4%		0.45%	P
grower:	14% Crude Protein	15%		17%	N NH_3 O
	0.3% Available Phosphorus	0.4%			P
developer:	13% Crude Protein	14%		16%	N NH_3 O
	0.25% Available Phosphorus	0.3%		0.35%	P
pre-lay:	15% Crude Protein	16%		18%	N NH_3 O
	0.27% Available Phosphorus	0.32%		0.42%	P

Environmental Stewardship Assessment for Poultry Diets (continued)

For each poultry group that applies in the left column, identify with an "X" on the scale below the crude protein and phosphorus levels for the groups fed.

	Low risk (risk 1)	Moderate-low risk (risk 2)	High-moderate risk (risk 3)	High risk (risk 4)	Environmental Benefits
	Nutrient Concentration in Diet (continued)				
Broiler Breeders start/grow:	15% Crude Protein	16%		18%	N NH_3 O
breeder hen:	0.35% Available Phosphorus	0.45%		0..5%	P
	14%% Crude Protein	16%		17%	N NH_3 O
male (separate fed):	0.25% Available Phosphorus	0.35%		0.45%	P
	11% % Crude Protein	12%		14%	N NH_3 O
	0.25% Available Phosphorus	0.35%		0.4%	P

I. Strategies to modify nitrogen in poultry manure and litter

A. Dietary strategies

1. Formulate based on amino acid requirements rather than crude protein.
2. Optimize the dietary amino acid profile with the bird's requirement e.g. "ideal protein concept".
3. Phase-feed poultry for their current rate of growth or production.
4. Utilize the "True Amino Acid Digestibility" of feed ingredients to enhance nitrogen retention and reduce excretion.
5. Select feed ingredients with low nutrient variability to reduce margins of safety in protein and amino acid formulation.
6. Utilize enzymes and feed additives to enhance nitrogen retention.
7. Avoid or control ingredient anti-nutritional factors to improve protein digestibility.

B. Management strategies

1. Reduce or eliminate moisture contamination of litter and manure.
2. Compost stored litter or manure to a stable endpoint.
3. Implement technologies for rapid drying of litter and manure.
4. Utilize litter/manure amendments for nitrogen and ammonia control.
5. Reduce bird stress and maintain health.
6. Implement sex separate rearing when possible.
7. Recycle fecal nitrogen via livestock feeding systems.

II. Strategies to modify phosphorus (P) in poultry manure and litter

A. Dietary strategies

1. Meet but do not exceed the P requirements of the bird
2. Select feed ingredients with readily available P.
    a. Phytic acid and plant vs. animal P sources
    b. Mineral sources and the impact of the Ca/P ratio.
    c. Impact of dietary Ca.
3. Use effective vitamin D levels and compounds.
4. Use feed additives/enzymes to enhance P retention.
5.

B. Management strategies

1. Minimize poultry stress.
2. Utilize litter/manure amendments to stabilize soluble P.
3. Manage feeding equipment.
4. Recycle fecal phosphorus into poultry and livestock feeding systems.
5. Export manure or litter when total P exceeds capacity.

Strategies to modify nitrogen in poultry manure and litter

Feeding Practice	Reduces Air Quality Impact	Reduces Ingredients/ Nutrients Purchased	Do You Currently Practice?	Will You Consider for Future?
A. Dietary strategies				
Formulate based on amino acid requirements rather than crude protein.				
Optimize the dietary amino acid profile with the bird's requirement e.g. "ideal protein concept".				
Phase-feed poultry for their current rate of growth or production.				
Utilize the "True Amino Acid Digestibility" of feed ingredients to enhance nitrogen retention and reduce excretion.				
Select feed ingredients with low nutrient variability to reduce margins of safety in protein and amino acid formulation.				
Utilize enzymes and feed additives to enhance nitrogen retention.				
Avoid or control ingredient anti-nutritional factors to improve protein digestibility.				
B. Management strategies				
Reduce or eliminate moisture contamination of litter and manure.				
Compost stored litter or manure to a stable endpoint				
Implement technologies for rapid drying of litter and manure.				
Utilize litter/manure amendments for nitrogen and ammonia control.				
Reduce bird stress and maintain health.				
Implement sex separate rearing when possible.				
Recycle fecal nitrogen via livestock feeding systems.				

Strategies to modify phosphorus (P) in poultry manure and litter

Feeding Practice	Reduces Ingredients/ Nutrients Purchased	Do You Currently Practice?	Will You Consider for Future?
A. Dietary strategies			
Meet but do not exceed the P requirements of the bird			
Select feed ingredients with readily available P			
Use effective vitamin D levels and compounds			
Use feed additives/enzymes to enhance P retention			
B. Management strategies			
Minimize poultry stress			
Utilize litter/manure amendments to stabilize soluble P			
Manage feeding equipment			
Recycle fecal phosphorus into poultry and livestock feeding systems			
Export manure or litter when total P exceeds capacity			

Review of Options:
Manure Transfer and Marketing to Off Farm Users

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Provides enhanced value of manure to user?	Significantly enhanced value	Some enhanced value	Little enhanced value	No enhanced value	Environmental Benefit
Marketing Issues					
Do you enhance the value of your manure by providing a nutrient analysis with it when it is exported?	Yes, I always provide nutrient analysis of manure I export that is less than 3 months olds.	Yes, I always provide nutrient analysis of manure I export that is less than year old.	I provide a nutrient analysis if the operation receiving the manure asks for it.	No, I do not provide nutrient analysis with the manure I export.	
Do you provide manure for a potential customer on a no-cost basis so they can see the potential crop benefits?	Yes, I deliver and spread manure at no-cost to a potential customer (on a small land area) and establish a field comparison of manure and commercial fertilizer	Yes, I deliver and spread manure at no-cost to a potential customer (on a small land area)	I deliver and spread manure for a charge below my cost to demonstrate the potential crop benefits.	No.	
Services Provided with Exported Manures					
Do you offer any agronomic services with your manure for:				No	
Manure sampling	Yes			No	
Adjusted application rate for individual fields	Yes			No	
Soil testing?	Yes			No	
Crop consulting services?	Yes			No	
Incorporation within 24 hr. to conserve ammonia?	Yes			No	
Supplement with commercial nutrients?	Yes			No	
Do you offer equipment services with manure for:					
Loading?	Yes			No	
Transport to site?	Yes			No	
Land Application?	Yes			No	

Review of Options:
Manure Transfer and Marketing to Off Farm Users (continued)

Provides enhanced value of manure to user?	Significantly enhanced value	Some enhanced value	Little enhanced value	No enhanced value	Environmental Benefit
Services Provided with Exported Manures (continued)					
Do you offer nuisance avoidance services with your manure for:					
Daytime application to avoid noise nuisance?	Yes			No	
Morning or early PM application to avoid odor?	Yes			No	O
Maintaining setback distances?	Yes			No	
Notification of neighbors?	Yes			No	
Same day incorporation to avoid odor and fly?	Yes			No	
Can you explain to a potential customer:					
The crop available nutrients in manure?	Yes			No	N
The benefits of organic carbon to crop production?	Yes			No	
The value of compost in reducing plant pathogens?	Yes			No	P

Provides enhanced potential to producer?	Significantly enhances potential	Some enhanced potential	Little enhanced potential	No enhanced potential	Environmental Benefit
Feasibility of Manure Export					
Do you handle your exported manure as a solid **or** separated solids?	Yes		No		
Do you compost manure to reduce volume to transport?	Yes, fully compost	Some composting occurs due to handling		No	N
Is there a manure broker in your area?	Yes, I am aware of a broker and use their services		There is a broker, but I have never contacted them.	There is no broker in my area.	P
Are you aware of neighboring farms that produce crops and could use manure?	There are farms within a 3-mile of my operation that could potentially use manure.	There are farms between 3 and 10 miles from my operation that could potentially use manure.	There are no farms within a 10-mile radius that can potentially use nutrient inputs.		

Reference Tables

Reference Table 1. Nutrient concentration in meat animals.

Species	Nitrogen Factor	Phosphorus Factor
Beef cattle < 1,000 lbs.	0.027	0.0073
Beef cattle > 1,000 lbs.	0.024	0.0065
Dairy cattle (replacement herd)	0.029	0.0083
Dairy cattle (milking herd)	0.025	0.0072
Swine < 100 lbs.	0.025	0.0056
Swine 100 to 300 lbs.	0.024	0.0047
Swine > 300 lbs.	0.023	0.0047
Poultry	0.028	0.0058
Goat	0.024	0.0060
Sheep	0.025	0.0060

Nitrogen and phosphorus factors represent the percentage (elemental nitrogen or phosphorus) of live weight divided by 100.

Reference Table 2. Fertilizer nutrient concentration.

Product	Nitrogen Factor	Phosphorus Factor
Anhydrous ammonia	0.82	
Aqua ammonia	0.20	
Ammonium nitrate	0.34	
Ammonium sulfate	0.21	
Ammonium nitrate-sulfate	0.30	
Urea	0.46	
Urea-ammonium nitrate (UAN)	0.28	
Phosphoric acid		0.24
Superphosphoric acid		0.35
Ordinary superphosphate		0.087
Concentrated superphosphate		0.20
Ammonium phosphate-sulfate	0.16	0.087
Ammonium phosphate-nitrate	0.27	0.052
Monoammonium phosphate	0.11	0.23
Diammonium phosphate	0.18	0.20
Ammonium polyphosphate - liquid	0.10	0.15
Ammonium polyphosphate - dry	0.11	0.25

Nitrogen and phosphorus factors represent the percentage (elemental nitrogen or phosphorus) of total commodity weight divided by 100.

Reference Table 3. NRC Feed Code Listing.

NRC Feed #	Common Name	Fraction: [1] Dry Matter	Crude Protein	Phos-phorus[2]
101	Bahiagrass 30% Dry Matter	0.30	0.089	0.0022
102	Bahiagrass Hay	0.90	0.082	0.0022
103	Bermudagrass Late Vegetative	0.91	0.078	0.0018
104	Brome Hay Pre-bloom	0.88	0.160	0.0037
105	Brome Hay Mid Bloom	0.88	0.144	0.0028
106	Brome Hay late Bloom	0.91	0.100	0.0000
107	Brome Hay Mature	0.92	0.060	0.0022
108	Fescue Meadow Hay	0.88	0.091	0.0029
109	Fescue Alta Hay	0.89	0.102	0.0024
110	Fescue K31 Hay	0.91	0.150	0.0037
111	Fescue K31 Hay Full Bloom	0.91	0.129	0.0032
112	Fescue K31 Mature	0.91	0.108	0.0030
113	Napiergrass Fresh 30 day DM	0.20	0.087	0.0041
114	Napiergrass Fresh 60 day DM	0.23	0.078	0.0041
115	Orchardgrass Hay, Early Bloom	0.89	0.128	0.0034
116	Orchardgrass Hay, Late Bloom	0.91	0.084	0.0030
117	Pangoliagrass Fresh	0.21	0.091	0.0022
118	Red Top Fresh	0.29	0.116	0.0037
119	Reed Canarygrass Hay	0.89	0.103	0.0024
120	Ryegrass Hay	0.88	0.086	0.0000
121	Sorghum Sudan Ha	0.91	0.113	0.0031
122	Sorghum-Sudan Pasture	0.18	0.168	0.0044
123	Sorghum-Sudan Silage	0.28	0.108	0.0021
124	Timothy Hay Late Vegetative	0.89	0.140	0.0040
125	Timothy Hay Early Bloom	0.89	0.108	0.0029
126	Timothy Hay Mid Bloom	0.89	0.097	0.0023
127	Timothy Hay Full Bloom	0.89	0.081	0.0020
128	Timothy Hay Seed Stage	0.89	0.060	0.0000
129	Wheatgrass Crest., Hay	0.92	0.090	0.0015
135	Grass Pasture Spring	0.23	0.213	0.0045
136	Grass Pasture Summer	0.25	0.150	0.0000
137	Grass Pasture Fall	0.24	0.220	0.0000
138	Mix Pasture Spring	0.21	0.260	0.0000
139	Mix Pasture Summer	0.22	0.195	0.0000
140	Range June Diet	0.20	0.110	0.0015
141	Range July Diet	0.20	0.105	0.0015
142	Range August Diet	0.20	0.097	0.0015
143	Range September Diet	0.20	0.069	0.0015
144	Range Winter	0.80	0.047	0.0015
145	Meadow Spring	0.15	0.203	0.0015
146	Meadow Fall	0.20	0.134	0.0015
147	Meadow Hay	0.90	0.134	0.0015
148	Prairie Hay	0.91	0.053	0.0014
201	Alfalfa Hay Early Vegetative	0.91	0.300	0.0033
202	Alfalfa Hay Early Vegetative	0.91	0.234	0.0033
203	Alfalfa Hay Late Vegetative	0.91	0.270	0.0033
204	Alfalfa Hay Late Vegetative	0.91	0.217	0.0033
205	Alfalfa Hay Early Bloom	0.91	0.250	0.0022
206	Alfalfa Hay Early Bloom	0.91	0.199	0.0022
207	Alfalfa Hay Mid Bloom	0.91	0.220	0.0022
208	Alfalfa Hay Mid Bloom	0.91	0.170	0.0024
209	Alfalfa Hay Full Bloom	0.91	0.170	0.0024
210	Alfalfa Hay Full Bloom	0.91	0.130	0.0024
211	Alfalfa Hay Late Bloom	0.91	0.170	0.0024
212	Alfalfa Hay Late Bloom	0.91	0.120	0.0024
213	Alfalfa Hay Mature	0.91	0.140	0.0021
214	Alfalfa Hay Seeded	0.91	0.120	0.0021
215	Alfalfa Hay Weathered	0.89	0.100	0.0023
216	Alfalfa Meal Dehydrated 15%CP	0.90	0.173	0.0025
217	Alfalfa Silage Early Bloom	0.35	0.195	0.0031
218	Alfalfa Silage Mid Bloom	0.38	0.170	0.0027
219	Alfalfa Silage Full Bloom	0.40	0.160	0.0027
220	Birdsfoot Trefoil, Hay	0.91	0.159	0.0023
221	Clover Ladino Hay	0.89	0.224	0.0033
222	Clover Red Hay	0.88	0.150	0.0024
223	Vetch Hay	0.89	0.208	0.0034
230	Leg Pasture Spring	0.20	0.280	0.0030
231	Leg Pasture Summer	0.23	0.222	0.0030
301	Barley Silage	0.39	0.119	0.0029
302	Barley Straw	0.91	0.044	0.0007
303	Corn Cobs Ground	0.90	0.028	0.0004
304	Corn Silage 25% Grain	0.29	0.083	0.0027
305	Corn Silage 25% Grain	0.29	0.083	0.0027
306	Corn Silage 35% Grain	0.33	0.086	0.0027
307	Corn Silage 40% Grain	0.33	0.092	0.0027
308	Corn Silage 40% GR + NPN	0.33	0.132	0.0027
309	Corn Silage 40% GR + NPN + Ca	0.33	0.130	0.0027
310	Corn Silage 45% Grain	0.34	0.087	0.0022
311	Corn Silage 45% GR + NPN	0.33	0.130	0.0027
312	Corn Silage 45% GR + NPN + Ca	0.33	0.130	0.0027
313	Corn Silage 50% Grain	0.35	0.080	0.0027
314	Corn Silage 50 + NPN + CA	0.35	0.130	0.0027
315	Corn Silage Immature (no ears)	0.25	0.090	0.0031
316	Corn Silage Stalklage	0.30	0.063	0.0000
317	Corn Stalks Grazing	0.50	0.065	0.0009
318	Oat Silage Dough	0.36	0.127	0.0031
319	Oat Straw	0.92	0.044	0.0006
320	Oat Hay	0.91	0.095	0.0025
321	Sorghum Silage	0.30	0.094	0.0022
322	Wheat Silage Dough	0.35	0.125	0.0029
323	Wheat Straw	0.89	0.035	0.0005
401	Barley Malt Sprouts w/hulls	0.93	0.281	0.0068
402	Barley Grain Heavy	0.88	0.132	0.0035
403	Barley Grain Light	0.88	0.140	0.0039
404	Corn Hominy	0.90	0.115	0.0057
405	Corn Grain Cracked	0.88	0.098	0.0032
406	Corn Dry Ear 45 lb./bu	0.86	0.090	0.0027
407	Corn Dry Ear 56 lb./bu	0.87	0.090	0.0027
408	Corn Dry Grain 45 lb./bu	0.88	0.098	0.0030
409	Corn Ground Grain 56 lb./bu	0.88	0.098	0.0031
410	Corn Dry Grain 56 lb./bu	0.88	0.098	0.0031
411	Corn Grain Flaked	0.86	0.098	0.0031
412	Corn HM Ear 56 lb./bu	0.72	0.090	0.0027
413	Corn HM Grain 45 lb./bu	0.72	0.098	0.0030
414	Corn HM Grain 56 lb./bu	0.72	0.098	0.0031
415	Cottonseed Black Whole	0.92	0.230	0.0062
416	Cottonseed High Lint	0.92	0.244	0.0062
417	Cottonseed Meal - Mech..	0.92	0.440	0.0076
418	Cottonseed Meal - Sol - 41% CP	0.92	0.461	0.0116
419	Cottonseed Meal - Sol - 43% CP	0.92	0.489	0.0076
420	Molasses Beet	0.78	0.085	0.0003
421	Molasses Cane	0.74	0.058	0.0010
422	Oats 32 lb./bu	0.91	0.136	0.0030
423	Oats 38 lb./bu	0.89	0.136	0.0041
424	Rice Bran	0.90	0.144	0.0173
425	Rice Grain Ground	0.89	0.089	0.0036
426	Rice Grain Polished	0.89	0.086	0.0013
427	Rye Grain	0.88	0.138	0.0036
428	Sorghum, Dry Grain	0.89	0.116	0.0034
429	Sorghum, Rolled Grain	0.90	0.126	0.0034
430	Sorghum, Steam Flaked	0.70	0.120	0.0034
431	Tapioca	0.89	0.031	0.0000
432	Wheat Ground	0.89	0.142	0.0044
433	Wheat Middlings	0.89	0.184	0.0100

[1]Fraction Dry Matter is the percentage dry matter of total commodity weight divided by 100.
Fraction Crude Protein and Fraction Phosphorus is indicated on a dry weight basis.
[2]Fraction Phosphorus is indicated as elemental phosphorus.

Table 2A-3. NRC Feed Code Listing (continued).

NRC Feed #	Common Name	Fraction: [1] Dry Matter	Crude Protein	Phosphorus[2]
434	Wheat Grain Hard Red Spring	0.88	0.142	0.0042
435	Wheat Grain Soft White	0.90	0.113	0.0033
501	Brewers Grain 21% Dry Matter	0.21	0.260	0.0070
502	Brewers Grain Dehydrated	0.92	0.292	0.0070
503	Canola Meal	0.92	0.409	0.0120
504	Coconut Meal	0.92	0.215	0.0021
505	Corn Gluten Feed	0.90	0.238	0.0095
506	Corn Gluten Meal	0.91	0.468	0.0051
507	Corn Gluten Meal 60% CP	0.91	0.663	0.0061
508	Distillers Grain + Solubles	0.25	0.295	0.0083
509	Distillers Grain Dehydrated - Light	0.91	0.304	0.0140
510	Distillers Grain Dehydrated - Interm.	0.91	0.304	0.0083
511	Distillers Grain Dehydrated - Dark	0.91	0.304	0.0140
512	Distillers Grain Dehydrated - Very Dk.	0.91	0.304	0.0140
513	Distillers Grain Solubles Dehydrated	0.91	0.297	0.0140
514	Distillers Grain Wet	0.25	0.260	0.0140
515	Lupins	0.90	0.342	0.0044
516	Peanut Meal	0.92	0.529	0.0066
517	Soybean Meal - 44	0.89	0.499	0.0071
518	Soybean Meal - 49	0.90	0.540	0.0071
519	Soybean Whole	0.90	0.403	0.0065
520	Soybean Whole Roasted	0.90	0.428	0.0065
521	Sunflower Seed Meal	0.90	0.259	0.0102
522	Urea	0.99	0.910	0.0000
601	Apple Pomace	0.22	0.054	0.0011
602	Bakery Waste	0.92	0.090	0.0024
603	Beet Pulp + Steffen's filt	0.91	0.100	0.0010
604	Beet Pulp Dehydrated	0.91	0.098	0.0010
605	Citrus Pulp Dehydrated	0.91	0.067	0.0013
606	Grape Pomace	0.90	0.000	0.0017
[illegible]	Soybean Hulls	0.91	0.122	0.0018
[illegible]	Bloodmeal	0.90	0.938	0.0032
702	Feather Meal	0.90	0.858	0.0038
703	Fishmeal	0.90	0.679	0.0314
704	Meat Meal	0.95	0.582	0.0434
705	Tallow	0.99	0.000	0.0006
706	Whey Acid	0.07	0.142	0.0071
707	Whey Delact	0.93	0.179	0.0118

NRC Feed #	Common Name	Fraction: [1] Dry Matter	Crude Protein	Phosphorus[2]
801	Ammonium Phos (Mono)	0.97	0.709	0.2474
802	Ammonium Phos (Dibasic)	0.97	1.159	0.2060
803	Ammonium Sulfate	1.00	1.341	0.0000
804	Bone Meal	0.97	0.132	0.1286
805	Calcium Carbonate	1.00	0	0.0004
806	Calcium Sulfate	0.97	0	0.0000
807	Cobalt Carbonate	0.99	0	0.0000
808	Copper Sulfate	1.00	0	0.0000
809	Dicalcium Phosphate	0.97	0	0.1930
810	EDTA	0.98	0	0.0000
811	Iron Sulfate	0.98	0	0.0000
812	Limestone	1.00	0	0.0002
813	Limestone Magnesium	0.99	0	0.0004
814	Magnesium Carbonate	0.98	0	0.0000
815	Magnesium Oxide	0.98	0	0.0000
816	Manganese Oxide	0.99	0	0.0000
817	Manganese Carbonate	0.97	0	0.0000
818	Mono-Sodium Phosphate	0.97	0	0.2250
819	Oystershell Ground	0.99	0	0.0007
820	Phosphate Deflourinated	1.00	0	0.1800
821	Phosphate Rock	1.00	0	0.1300
822	Phosphate Rock - Low Fl	1.00	0	0.1400
823	Phosphate Rock - Soft	1.00	0	0.0900
824	Phosphate Mono-Mono	0.97	0	0.2250
825	Phosphoric Acid	0.75	0	0.3160
826	Potassium Bicarbonate	0.99	0	0.0000
827	Potassium Iodide	1.00	0	0.0000
828	Potassium Sulfate	0.98	0	0.0000
829	Salt	1.00	0	0.0000
830	Sodium Bicarbonate	1.00	0	0.0000
831	Sodium Selenite	0.98	0	0.0000
832	Sodium Sulfate	0.97	0	0.0000
833	Zinc Oxide	1.00	0	0.0000
834	Zinc Sulfate	0.99	0	0.0000
835	Potassium Chloride	1.00	0	0.0000
836	Calcium Phosphate (Mono)	0.97	0	0.2160
837	Sodium TriPoly Phosphate	0.96	0	0.2500
999	Minerals	0.99	0	0.0000
	L-lysine.HCl		0.958	0.0000
	DL-methionine			

[1]Fraction Dry Matter is the percentage dry matter of total commodity weight divided by 100.
Fraction Crude Protein and Fraction Phosphorus is indicated on a dry weight basis.
[2]Fraction Phosphorus is indicated as elemental phosphorus.
Source: National Research Council Nutrient Requirements for Beef Cattle 1996.

Reference Table 4.. Plant nutrient uptake by specified crop and removed in the harvested part of the crop. Reference: NRCS Agricultural Waste Management Field Handbook. 1992. Table 6-6 found on pages 6-19 through 6-22.

Crop	N	P_2O_5	Units
Grain Crops			
Barley (Grain)	0.87	0.37	lbs./bu.
(Straw)	15.00	5.04	lbs./ton
Buckwheat (Grain)	0.79	0.34	lbs./bu.
(Straw)	15.60	2.29	lbs./ton
Corn Grain (Grain)	0.90	0.36	lbs./bu.
(Stover)	22.20	9.16	lbs./ton
Oats (Grain)	0.62	0.25	lbs./bu.
(Straw)	12.60	7.33	lbs./ton
Rice (Grain)	0.63	0.25	lbs./bu.
(Straw)	12.00	4.12	lbs./ton
Rye (Grain)	1.16	0.33	lbs./bu.
(Straw)	10.00	5.50	lbs./ton
Sorghum (Grain)	0.94	0.46	lbs./bu.
(Stover)	21.60	6.87	lbs./ton
Wheat (Grain)	1.25	0.85	lbs./bu.
(Straw)	13.40	3.21	lbs./ton
Oil Crops			
Flax (Grain)	2.29	0.71	
(Straw)	24.80	5.04	lbs./ton
Peanuts (Grain)	36.00	3.89	lbs./1000 lbs.
(Vines)	46.60	10.99	lbs./ton
Rapeseed (Grain)	1.80	0.90	lbs./bu.
(Straw)	89.60	19.69	lbs./ton
Soybeans (Grain)	3.75	0.88	lbs./bu.
(Stover)	45.00	10.08	lbs./ton
Sunflower (Grain)	35.70	39.16	lbs./1000 lbs.
(Stover)	30.00	8.24	lbs./ton
Fiber Crops			
Cotton	26.70	13.28	lbs./1000 lbs.
(Seed Stalk)	17.50	5.04	lbs./1000 lbs.
Pulpwood	0.12	0.05	%
(Bark & branches)	0.12	0.05	%
Forage Crops			
Alfalfa	45.00	10.08	lbs./ton
Bahiagrass	25.40	5.95	lbs./ton
Big bluestem	19.80	2.90	lbs./ton
Birdsfoot trefoil	49.80	10.08	lbs./ton
Bluegrass-pastd.	58.20	19.69	lbs./ton
Bromegrass	37.40	9.62	lbs./ton
Clover-grass	30.40	12.37	lbs./ton
Dallisgrass	38.40	9.16	lbs./ton
Guineagrass	25.00	20.15	lbs./ton

Crop	N	P_2O_5	Units
Forage Crops (continued)			
Bermudagrass	37.60	8.70	lbs./ton
Lespedeza	46.60	9.62	lbs./ton
Little bluestem	22.00	2.90	lbs./ton
Orchardgrass	29.40	9.16	lbs./ton
Panagolagrass	26.00	9.07	lbs./ton
Paragrass	16.40	17.86	lbs./ton
Red clover	40.00	10.08	lbs./ton
Reed canarygrass	27.00	8.24	lbs./ton
Ryegrass	33.40	12.37	lbs./ton
Switchgrass	23.00	4.58	lbs./ton
Tall fescue	39.40	9.16	lbs./ton
Timothy	24.00	10.08	lbs./ton
Wheatgrass	28.40	12.37	lbs./ton
Silage Crops			
Alfalfa haylage	27.90	7.56	lbs./ton
Corn silage	7.70	4.01	lbs./ton
Forage sorghum	8.64	2.61	lbs./ton
Oat haylage	12.80	5.13	lbs./ton
Sorghum-sudan	13.60	3.66	lbs./ton
Sugar Crops			
Sugarcane	3.20	1.83	lbs./ton
Sugar beets	4.00	1.37	lbs./ton
Sugar beet tops	8.60	1.83	lbs./ton
Tobacco			
All types	37.50	7.56	lbs./1000 lbs.
Vegetable Crops			
Bell peppers	8.00	5.50	lbs./ton
Beans, dry	62.60	20.61	lbs./ton
Cabbage	6.60	1.83	lbs./ton
Carrots	3.80	1.83	lbs./ton
Cassava	8.00	5.95	lbs./ton
Celery	3.40	4.12	lbs./ton
Cucumbers	4.00	3.21	lbs./ton
Lettuce (heads)	4.60	3.66	lbs./ton
Onions	6.00	2.75	lbs./ton
Peas	73.60	18.32	lbs./ton
Potatoes	6.60	2.75	lbs./ton
Snap beans	17.60	11.91	lbs./ton
Sweet corn	17.80	10.99	lbs./ton
Sweet potatoes	6.00	1.83	lbs./ton
Table beets	5.20	1.83	lbs./ton

Farmstead Facilities Manure and Related Effluents Module

Table of Contents

Introduction

Objective

The goal of this assessment package is to help a livestock or poultry producer confidentially evaluate their farmstead facilities on issues that relate to manure handling. This package will assist in:

- Assessing your operation's compliance with commonly regulated issues
- Minimizing impact of agricultural activities on water quality near your facilities
- Reducing the likelihood of environmental complaints
- Setting priorities for improved environmental practices.

Environmental Benefits

Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

N	Reduce Nitrogen risk	SS	Reduced Suspended Solids risk
P	Reduced Phosphorus risk	NH_3	Reduced Ammonia emission
Pa	Reduced Pathogen risk	O	Reduced Odor risk
A	Improved Farm Aesthetics	$	Financial Benefits

Why Should I Be Concerned?

Agricultural practices can have a detrimental effect on water quality. Often the farm water supply is at the greatest risk. Protecting the drinking water of your family and your animals is vital. Neighboring water supplies can also be affected. Pathogens and nitrates can cause health problems. People and animals can become diseased from agriculture related water borne pathogens. Excess nitrates may cause "blue baby" syndrome or cause the loss of a fetus.

Local surface waters may be important aesthetically, recreationally and/or for wildlife. Water quality problems from excess nutrient loading, sediment, and Biological Oxygen Demand (BOD) can come from farm runoff. You or your neighbors may not want to see these water uses negatively impacted. Excess nutrients can accelerate the growth of aquatic plants and algae that then respire or decay creating low oxygen levels that will impact desirable aquatic life. The decaying plants can add to odor problems as well. BOD can have the same impact on water as it decays. High BOD added to water will lower the oxygen levels and also create an odor problem. Sediment and organic matter can discolor the water. Sediment can also cover feeding and breeding areas for fish and other aquatic life.

Dirty water, odors, and unsightly facilities present a poor image of agriculture to your neighbors. This not only increases the publics concern about water quality but also reflects a bad image on the commodities that you produce.

There may be regulations that control some of the practices on your farm. Good business risk management requires that you evaluate your operation for opportunities to reduce the risk of non-compliance. By taking a proactive approach you may avoid complaints and further regulations.

Some environmental improvements may improve the health of your livestock creating greater profits. Keeping nutrients contained can help reduce fertilizer costs. A better image for your farm may increase the marketability of your products.

How Do I Proceed?

This assessment is broken into four major sections. The first section is the *Regulatory Compliance Review* that looks at the regulations that your operation should comply with and assesses your knowledge of and compliance with these regulations.

This is followed by the *Site Review* that should provide you with a better understanding of the environmental risks associated with the facilities' site characteristics. While these characteristics may be difficult to modify, your understanding of these risks will allow you to manage the operation to reduce environmental impacts. The *Systems and Management Review* is broken into several worksheets on different topics. This section is meant to highlight practices on your farm that present risks to the environment. After each worksheet there is a Strengths and Weaknesses section, which you can fill out in order to identify your strengths and weaknesses in the worksheets topic. After completing each of the worksheets you will be ready for the *Identification of Strengths, Weaknesses, and Priorities* section, which is meant to encompass all of the topics. You will be requested to review the issues that have been raised throughout the manure and related effluents assessment and develop a plan for continuous improvement. The final section is called *Review of Options*. This section provides you with more detailed tools, options for improvement and references. Many of these tools may be referenced in the assessment portion while other may simply provide for a more detailed analysis of certain aspects of your operation.

Remember, the goal of this tool is to help you, and it is a completely voluntary assessment. If you do not want to complete certain portions, or are unsure of your answers, feel free to either seek further assistance from trained professionals or simply skip that question. Hopefully, the tool will help you to not only identify environmental risks and where you have done a good job of environmental stewardship, but also help you improve the profitability and sustainability of your operations.

1. For each issue listed (left hand column) in the "Regulation Compliance Review: Farmstead Facilities – Manure and Related Effluent" worksheets, identify if this issue is regulated by federal, state, or local authorities to which you are responsible (middle column), and determine if your farmstead facilities are in compliance with these rules (right hand column).

2. For each issue listed in the left-hand column of the "Worksheets", read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

3. In the Farm Facilities Planning Guide, identify the strengths and weaknesses of your Manure and Related Effluents operation environmental stewardship and environmental compliance. Based upon these strengths and weaknesses, identify the changes planned for reducing your operations environmental risks. Establish a preliminary estimate of the resources required for implementation of this change and the date you plan to have it implemented.

Acknowledgements

The _____ Committee would like to thank the following agencies, organizations, groups, and programs from their contributions to the development of this tool:

New York Agricultural Environmental Management, Nebraska Farm*A*Syst, Iowa Farm*A*Syst, National Pork Producers Council.

Regulatory Compliance Review: Farmstead Facilities – Manure and Related Effluents

Instructions: The goal of this assessment package is to help a livestock or poultry producer identify regulations that apply to their operation. For each issue listed (left hand column) of the worksheets, identify if this issue is regulated by federal, state, or local authorities (middle column), and determine if your operation is in compliance with these rules (right hand column).

Instructions to State Pilot Team: *This is meant to be a template for you to modify to address state specific regulations before it is used by producers. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response. You may want to leave some regulatory issues in if you think it might be implemented in your state in the future. Current federal NPDES regulations do not address nutrient management planning (NMP). Thus no summary of federal rules about NMPs are included.*

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Is my livestock/ poultry operation in compliance?
What agency(ies) is(are) involved in administrating regulations related to farmstead and manure storage issues?	___ US EPA ___ State ___ Local *List Name, Address, Phone #:*	
Is your farm classified under the EPA heading of CAFO (Concentrated Animal Feeding Operation)? See Environmental Stewardship Goals Module.		___ Yes ___ No ___ Not applicable ___ Don't Know
Farmstead Permits and Planning		
What building or construction permits are you required to have?		___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to have an emergency action plan for: - manure discharges/spills? - gravity drain valves? - power failures? - unusual storm events? - other? _____	___ Yes ___ No If Yes, summarize:	 ___ Yes ___ No ___ Yes ___ No ___ Yes ___ No ___ Yes ___ No
Is a storm water or erosion control plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there conditions or situation that will trigger a public hearing?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there specific pathogen management planning requirements?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there any biosecurity planning requirements?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a CNMP plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a closure plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there specific treatment systems that you are required to have on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a drainage plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Is a contingency action plan for perimeter drains required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a ground water contingency action plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Farmstead Location		
Are there any required setbacks or separation distances from barns, barnyards/feedlots, manure storage, wastewater treatment, and/or feed storage runoff/leachate with any of the following?		
Property lines	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Residences	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Surface Water	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Public facilities	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Highways	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Wells	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Sinkholes	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Others? _____	___ Yes ___ No; If yes, how far?	___ Yes ___ No
_____	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Are there required flood plain or water table considerations in siting any facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulated site conditions specific to construction of earth work?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Testing		
Are you required to test adjacent surface water?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to take ground water or monitoring well samples?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to sample perimeter drains around any structures?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there other specific quality assurance tests that must be conducted on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are your employees required to be certified in manure handling, spreading, emergency response, and/or other _____?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Record Keeping & Reporting		
Are records required for the animal housing and manure handling systems (pumps, piping, etc.)? If so, what records are required?		
- Animal inventory?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No
- Equipment Operation and Management records?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Yes ___ No ___ Yes ___ No
- Manure spills?	___ Yes ___ No If Yes, summarize:	
- Farmstead and facility maps?	___ Yes ___ No If Yes, summarize:	
Are inspections of the following required, and if so, how often?	Pipelines ___ Yes ___ No If Yes, summarize: Manure Pumps ___ Yes ___ No If Yes, summarize: Perimeter Drain Pumps ___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are records required for operation of the barnyard or open lot runoff containment system? If so, what records are required?	Federal rules require daily records of precipitation, storage level, and land application of holding pond water.	
- Storage level?		___ Yes ___ No
- Land application records?		___ Yes ___ No
- Precipitation records?		___ Yes ___ No
- Equipment/storage maintenance records?		___ Yes ___ No
- Structural integrity inspection records?		___ Yes ___ No
- Other? _____		___ Yes ___ No
Do manure spills have to be reported?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Runoff Controls for Open Lots, Barnyards, and Other Facilities		
What agency(ies) is(are) involved in administrating regulations related to containment of runoff from open lot livestock systems?	*List Name, Address, Phone #:* US EPA National Pollution Discharge Elimination System (NPDS) rules govern the control of runoff from open lots. These federal rules may be administered as part of a state regulatory program and thus implemented by a state regulatory agency. Federal rules require an NPDES permit for open lots with more than 1,000 animal units with the potential to discharge, for open lots of 300 to 999 animal units that discharge through a man made device (e.g. ditch or pipe), or for any open lot that discharges directly to waters of the U.S. US EPA has proposed changes to NPDES rules. These changes are currently under review and should be announced on December 2002. ___ State: ___ Local:	

Is containment and/or control of open lot/barnyard runoff regulated?	Yes, federal rules require containment of runoff for all facilities required to have a NPDES permit.	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a design that limits surface water discharge required?	Yes, federal rules require a containment system that prevents any discharge except under chronic wet periods or storm events exceeding a 25-yr., 24-hr. storm.	___ Yes ___ No ___ Not applicable ___ Don't Know
What design requirements must be considered in sizing total containment systems: - Runoff from 25-yr., 24-hr. storm or similar storm event. - Freeboard - Storage of normal precipitation runoff.	Federal rules require a storage capacity that will not allow discharge during a storm events less than a 25-yr., 24-hr. storm. No specific requirements are stated for freeboard and other volumes.	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning manure or wastewater flow from barns on your operation?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning storm water flows and erosion water from clean water areas for your operation?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are feed/silage run-off controls required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are waste water controls/treatment required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Odor and Air Quality Issues		
Are there air quality regulations or standards required of your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is an odor or air quality control plan required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to test for air quality?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a complaint response protocol required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there confined space regulations that apply to worker safety?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Other Locally Regulated or Nuisance Issues		
Are there restrictions to road access around your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations in the following areas when hauling materials in the area of your facility?	Weight ___ Yes ___ No If Yes, summarize: Vehicle lighting ___ Yes ___ No If Yes, summarize: Cargo Coverage ___ Yes ___ No If Yes, summarize: Vehicle safety ___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are activities restricted by zoning (e.g. noise, road, traffic, or other nuisance issues)?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other? _____	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Site Review:
Farmstead Facilities: Manure and Related Effluents

General: *Record the number of animals at each farmsite.*

List each farmsite on your farm	Is it used year round? If not, how long?	Type of animals at site	Average size of animals at site (lbs.)	Number of animals
1.				
2.				
3.				
4.				

Maps: Two types of maps are recommended: 1) for General Site Assessment: Identifying Community and Odor Concerns that covers a wide area, and 2) more specific Farmstead Site Assessment: Identify Water Quality Concerns.

Site Assessment: Identifying Community and Odor Concerns

Purpose: This map will provide a general picture of the rural community in which this livestock operation is or will be located. It can be used to assist in reviewing relevance of air and surface water quality issues within this community. The map should be large enough to include all facilities and land application sites. To satisfy some permit processes, these must be illustrated on a USGS Quadrangle map or appropriate equivalent. Copies of quadrangle maps are available through local USDA Natural Resource Conservation Service offices. The attached grid can be used for mapping odor issues or water related concerns that will not be used as part of a permit application.

Using available maps or community knowledge complete the following steps.

General

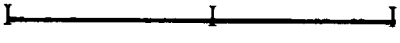
Legend

1. Indicate "North" on map. Label the northeast section on the map with its section number.

2. Identify the location of the Farmstead Site (FS) near center of grid and Land Application Sites (LA).

3. Identify location of all neighbors within 2 miles of livestock facilities including: Homes (H), Residential Areas(RA), and Public Facilities (PF).

4. Identify location of roads



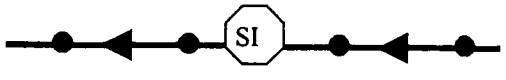
Water Quality

5. Identify location of surface water including

- perennial (continuous) streams,

- intermittent streams,

- drainage tiles and surface inlets (SI)



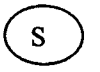
- drainage ditches

- Small ponds, reservoirs, or wetlands;

- grassed waterways

6. Identify connections to ground water

- Well locations 

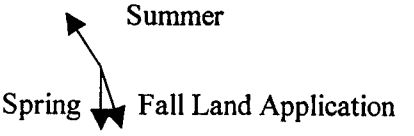
- Sinkholes 

- Shallow to bedrock areas 
- Agricultural injection well 

Air Quality

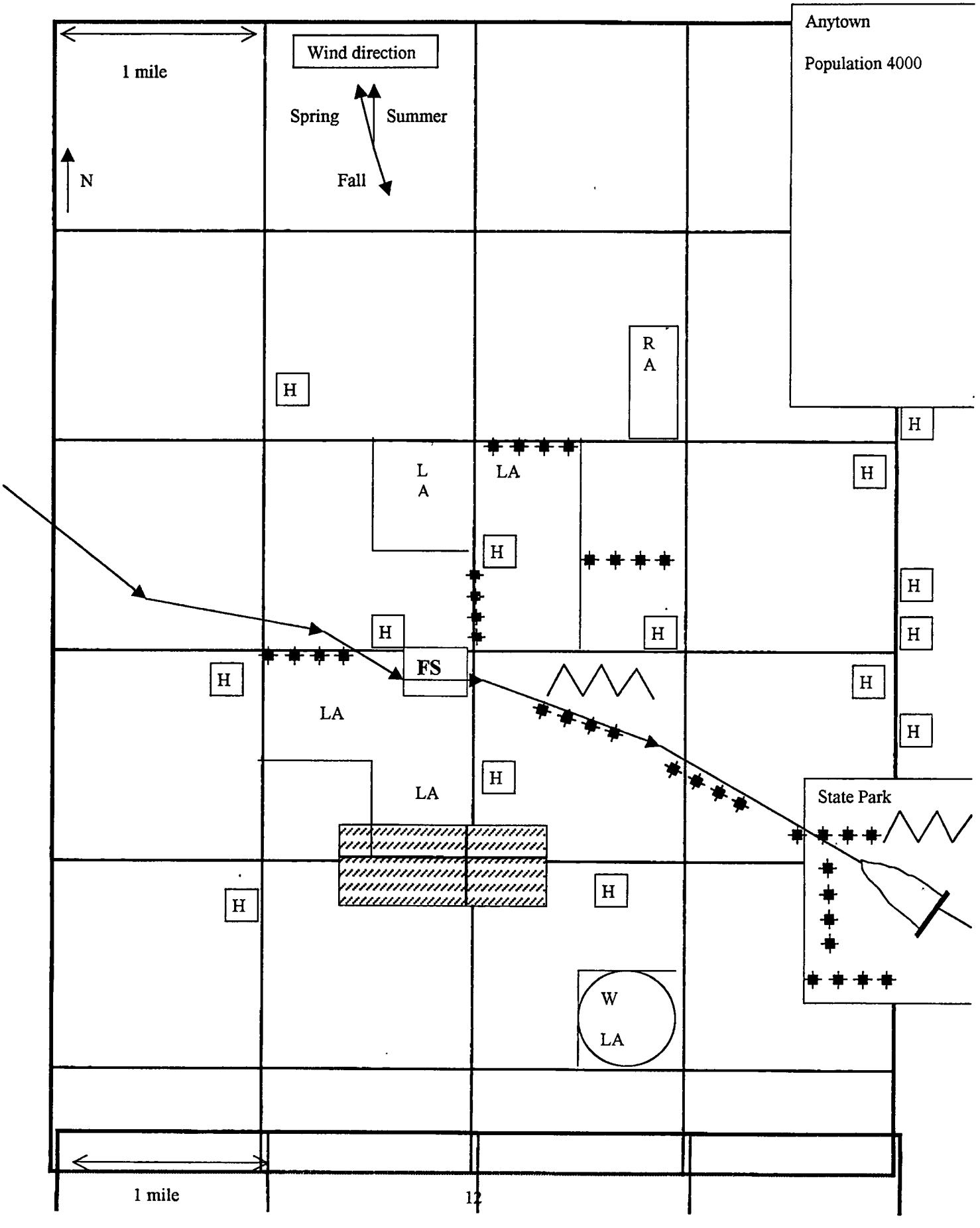
7. Mark location of shelter belts, hills, or other sudden changes in topography that encourage dissipation of odor. 

8. Draw arrows to indicate the prevailing wind direction for
   a) summer,
   b) time(s) of year manure is land applied, and
   c) early spring (if treatment lagoon or storage is part of operation).



9. Circle any homes or public facilities that are at an elevation below a potential odor source (high risk locations) 

Community Siting Example Map



Farmstead Site Assessment: Identifying Water Quality Concerns

Purpose: These maps will provide a framework for identifying potential farmstead sources of ground and surface water contamination from manure and related pollutants. The attached grid can be used for mapping these concerns. Some permit processes require that water quality related issues must be illustrated on a USGS Quadrangle map or appropriate equivalent. Copies of quadrangle maps are available through local USDA Natural Resource Conservation Service offices.

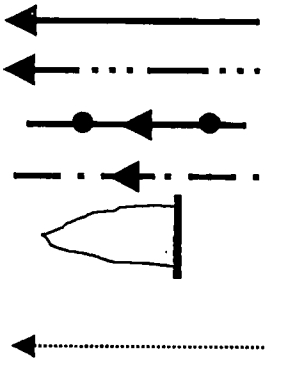
Instructions: Fill out a copy of the attached diagram or a quadrangle map for each farm site.

Land Features:

Legend

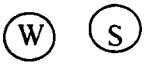
Location of surface water and other hydrologically sensitive areas, including

- perennial (continuous) streams,
- intermittent streams,
- drainage tiles,
- drainage ditch
- Small pond, reservoir or wetland;
- Runoff flows



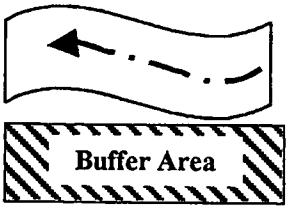
Well or sinkhole locations shallow to bedrock

(mark abandoned or dry wells as such)



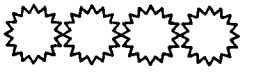
Conservation measures

- grassed waterway
- Other (e.g. buffer areas, or grass strip). Clearly label each conservation practice.



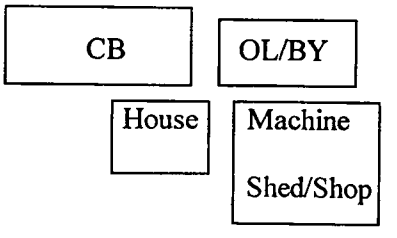
Farm property boundary

- Wind Breaks

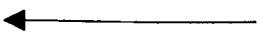


Farmstead Features:

- Confinement Barn and Open Lots/ Barnyards
- House and other buildings



- Slope/direction of water flow



- Silage storage/silo (SS)

- Roads

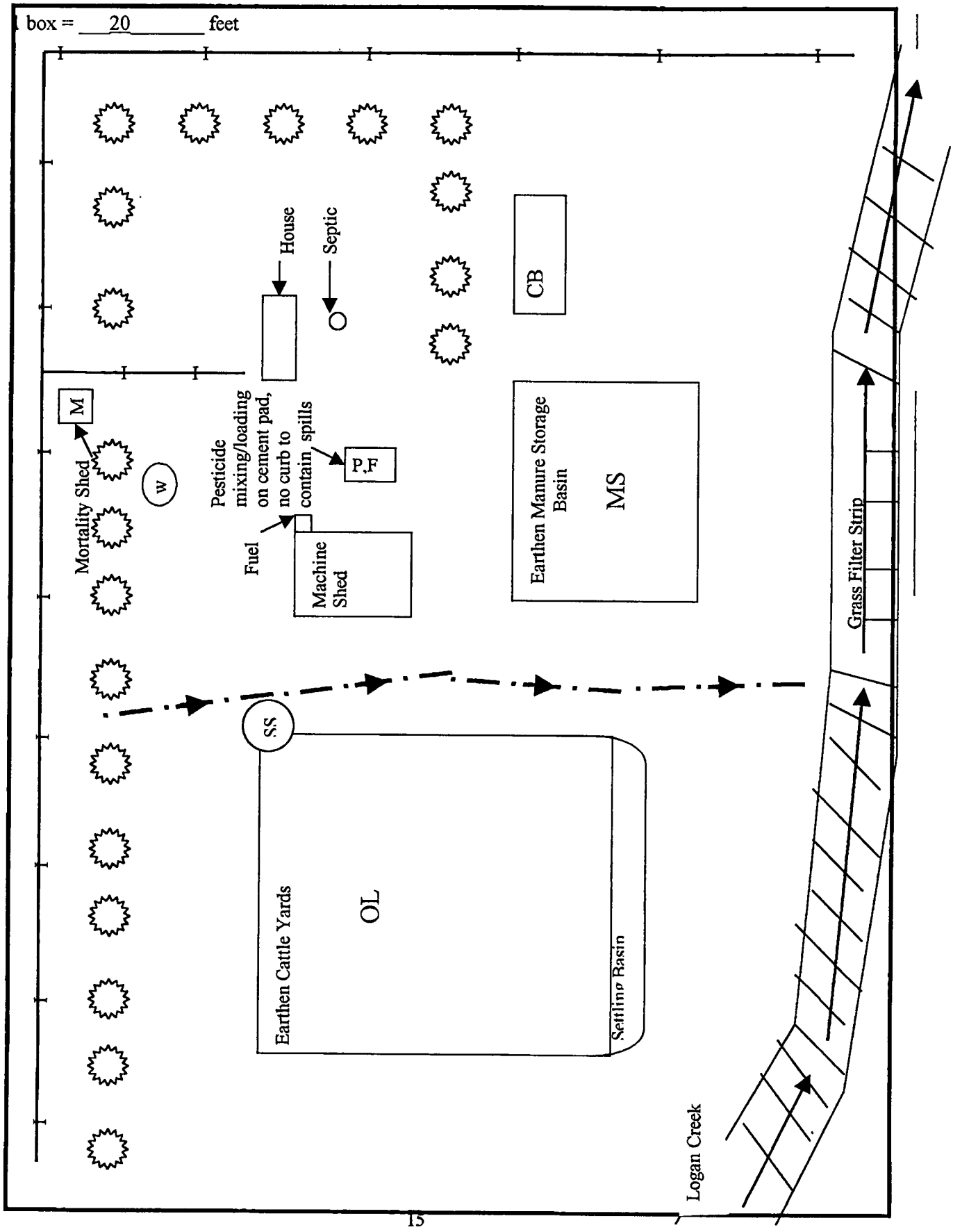
If you are doing a multimedia evaluation, consider adding:

- Location of pesticide (P), fertilizer (F), fuel (Fu) and other hazardous material, storage, and mixing/loading areas.

- Waste disposal (WD) sites (burn barrel, dump)

- Mortality (M) sites

Site Review: Farmstead Facilities Example Map



Site Review:
Farmstead Facilities Map

1 box = _____ feet

Site Appearance Review

Well-maintained grounds show that the owner takes pride in the operation and then likely takes pride in stewardship issues as well. Depreciating facilities give the impression that the operation may be cutting financial corners. Weeds and trash may harbor vermin that can create nuisances, economic losses, and pathogen vectors.

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Farmstead Appearance

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What is the general appearance of each farmsite	Farm buildings and grounds look like no effort is made to keep them in good repair. Visible manure or wastewater ponding. Animals (if visible) look dirty and uncared for.	Buildings and facilities in need of repair	Buildings and ground look generally in good repair.	Buildings and grounds are landscaped to show a professional image.	A
Are grassed areas mowed?	No			Yes	
Are buildings at the farmstead painted, clean, and in good repair?	No			Yes	
Is the farmsite free of weeds and visible trash piles?	No			Yes	
Are rodents, flies, and other vermin controlled?	No			Yes	
Is the farmsite free of ponded, spilled, or leaking manure or other effluents?	No			Yes	
Is farmsite free of spilled or leaking feed commodities?	No			Yes	
Is the farm free of ponded water or poorly drained areas?	No			Yes	A
Are roadways on the farmstead free of mud and manure?	No			Yes	
Is there proper grading so that surface water between barns drains freely away from buildings?	No			Yes	O
Are ventilation curtains, fans, shutters, and guards free from dust and debris?	No			Yes	
Is the site picked up and free of junk or abandoned equipment?	No			Yes	

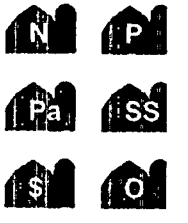
Are surface water flow areas well vegetated, graded, and protected from erosion?	No			Yes	A SS

Systems and Management Review: Farmstead Facilities: Manure and Related Effluents

For each issue listed in the left column of the worksheet, read across to the right and check the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Environmental Planning

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Do you have a plan for emergencies such as:	No	An emergency plan exists	An updated emergency plan is available at several locations on the farm	An updated emergency plan is available to all employees. They have been trained in it and have the authority to implement the plan when needed.	
Manure discharges/spills?	___	___	___	___	
Gravity drain valve leakage?	___	___	___	___	
Power failures?	___	___	___	___	
Unusual storm events?	___	___	___	___	
Other? _____	___	___	___	___	
Do you have a record keeping system for animal housing and manure handling systems addressing:	No			An organized record keeping system is kept up to date	
Animal Inventory?	___			___	
Equipment Operation and Management?	___			___	
Manure Spills?	___			___	
Farmstead and Facility Maps?	___			___	

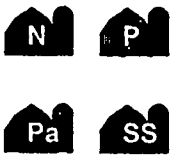
	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Do you have a record keeping system for the barnyard or open lot runoff containment system addressing: Storage level? Land application timing/amounts? Precipitation? Equipment/storage O&M? Structural integrity inspections?	No — — — — —			An organized record keeping system is kept up to date — — — — —	
Do you have a monitoring system in place?	No			Monitoring of manure handling systems for surface water, ground water, and air quality risks have been reviewed and appropriate plans initiated to address high risk issues.	
Do you have a standard operating procedure for daily manure management	No			All employees on the farm have an SOP that describes how to deal with manure.	

Manure Handling Runoff Issues

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Nearest surface water source to manure storage/handling area. *(These distances may vary from region to region. It is also used in Barnyard runoff distances.)*	Less than 100 feet *Let this distance be "X"*	1X to 2X feet	2X to 5X feet	Greater than 5X feet	
Are spills from loading and unloading the manure storage contained?	Spills are not contained and are not cleaned up	Spills are not contained but are cleaned up as they occur		Positive methods exist to contain and control any spills	
Is there a drainage area flowing into the manure storage that is not designed for those flows?	Drainage area of more than 4 times the surface area of the storage flows into the storage	Drainage area of more than 2 times the surface area of the storage flows into the storage	Drainage area of no more than 1 times the surface area of the storage flows into the storage	No drainage area flows into the storage	 
Short-term manure storage		Manure cleaned from pens is land applied immediately or stored for less than 2 months at a site 300 feet away from wells or surface water sources.		Short term storage is completely contained.	
How much manure storage capacity does your farm have (including temporary manure piles)? *(See Manure Storage Assessment for further review of these practices)*	Manure is not stored. AND Temporary manure pile areas have not been identified.	Manure storage is less than 120 days. AND Temporary manure pile areas are designated for use when ground is frozen or saturated	Between 120 and 270 days.	Greater than 270 days.	   
Drainage around manure storage/handling area	Poor drainage and access roads make manure removal possible only under dry conditions.			Excellent drainage and access roads make manure removal possible in a variety of weather conditions.	    
Crop land base in vicinity of storage (see Land Application Assessment for further review of these practices)	Insufficient cropland is available to which manure can be transported.		Sufficient cropland is available for managing manure nitrogen to which manure can be transported.	Sufficient cropland is available for managing manure phosphorus to which manure can be transported.	 

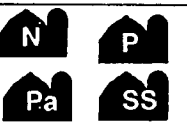
Barnyard/Feedlot Runoff Issues

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Barnyard/Feedlot Groundwater Control					
Unused/abandoned lots	Manure was not removed within six months of abandonment and structures and site are not maintained. OR Feedlots used intermittently OR Winter feeding			Following depopulation all manure removed and properly land-applied and structures and site maintained in good condition.	
Ground water protection: - Soil permeability below yard surface	Excessively well-drained, coarse-textured soils (sands, sandy loam) to gravel, or poorly drained soils	Moderately well-drained coarse textures soils (sands, sandy loam)	Well-drained or moderately well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays)	Well-drained medium- or fine-textured soils (loam, silt loam, clay loam, clays)	N
- Soil depth to fractured rock, coarse –textured soils or gravel.	Very shallow soils (less than 20 inches).	Shallow (20-30 inches).	30-40 inches deep.	More than 40 inches deep.	Pa
- Depth to ground water	Less than 10 feet	10 to 20 feet	20 to 50 feet	More than 50 feet	
Down gradient flow distance from yard to: Private well	Less than 100 feet.		100-200 feet.	100 to 200 feet and well is located up slope from yard.	
Public water well	Less than 1,000 feet.		More than 1,000 feet.	More than 1,000 feet and well is located up slope from yard.	
Barnyard/Feedlot Runoff Control Design					
Location of Barnyard or Feedlot to Flood plains?	Feedlot is located in flood plain.			Feedlot is located outside of flood plain or above high ground water table.	N P Pa SS
Surface water diversion	Roof or up slope surface water runs through the yard.	Some up slope surface water and roof water is diverted away from yard.	Most up slope surface and roof water is diverted away from yard.	All up slope surface and roof water is diverted away from yard.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Yard surface	Earthen yard experiences periods of several months with no animal traffic.	Earthen yard has constant animal traffic but extended periods of low animal density. Some areas are overtaken by weeds.	Earthen surface experiences almost continuous animal traffic	Concrete	
Classification of surface water potentially impacted by open lot.	Drinking Water	Contact recreation water		Not a drinking or contact recreation water supply. AND No particular pollutant is stressing the surface water.	

Your response to the first question below on this page addressing "Type of runoff control system" determines which of the next three sections is appropriate for your operation. The first section addresses situations where runoff is contained in a runoff holding pond, "Low" risk response (go to section A). The second section address situations where runoff is contained in an overland flow or an infiltration area or wetlands, "High-Moderate" and "Moderate-low" risk responses (go to section B). The third section addresses situations where runoff is not contained, a "High" risk response (go to section C).

The separation distances are based on the same risk associated with a manure storage facility near surface water. The distance, "X", should be based upon regional considerations such as rainfall intensity, topography, geology, and regulations.

I. Barnyard/Feedlot and Runoff Control Design (continued)					
Type of runoff control system	Yard runoff is not contained and is concentrated into stream (channel flow) by ditch, waterway, ravine, or stream. Jump to Section C	Yard runoff is not contained but flows evenly (sheet flow) over permanently vegetated areas. Jump to Section B	Total containment of all yard runoff into settling basin followed by grassed infiltration area or constructed wetlands. Jump to Section B	Total containment of all yard runoff into runoff holding pond. Jump to Section A	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
A. If Runoff is Contained in Holding Pond ("Low" Risk Response for "Type of runoff control system")					
Runoff holding pond capacity	Design capacity of holding pond is unknown. OR Capacity is insufficient to handle runoff from 25 year, 24 hour storm.	Solids accumulation in holding pond has not been removed in recent years and holding capacity is diminished.		Capacity to handle precipitation on storage and runoff from 25 year, 24 hour storm plus normal runoff for to avoid runoff application on frozen soils	
Water flow distance from holding pond to - Nearest surface water - Tile line - Surface inlet to tile line - Agricultural drainage well - Sinkhole *(X is the minimum separation distance that is either recommended or required from manure storage to surface water)*	The separation is Less than X	The separation is 1 to 2X	The separation is 2 to 3X	The separation is Greater than 3X	
Storage level marker	No liquid level indicator is available.	Permanent marker allows measurement of liquid depth.	Permanent marker allows measurement of remaining storage capacity.	Permanent marker allows measurement of remaining storage capacity and highly visible indicator of when insufficient capacity is available for 25-year, 24-hour storm event runoff.	
Runoff containment overflow	None	Emergency spillway directs flow to ditch or drainage.	Emergency spillway directs flow across cropland	Emergency spillway directs flow across permanent vegetation (pasture, alfalfa,)	
Gravity Drains	Only one shutoff valve is available and is not locked.	Either two valves OR One locked valve	Two shutoff valves are available and at least one shutoff is locked.	No gravity drain exists	
Frequency of liquid removal?	Liquid levels commonly will not handle a 25-year, 24-hour storm. OR Liquid level to maintain 25-year, 24-hour storm capacity is unknown.		Liquid level is lowered to maintain capacity for 25-year, 24-hour storm under most circumstances.	Liquid level is always maintained at the capacity for a 25-year, 24-hour storm.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Frequency of inspection:	Not inspected	Less frequently			
- Land application equipment?	____	____	Weekly during land application	Daily during land application	
- Liquid levels?	____	____	Monthly	Weekly and after each precipitation event	
			Quarterly	Monthly	
- Earthen storage liner erosion or damage?	____	____	____	____	
- Berm sod cover and erosion?	____	____	____	____	
- Tree and large weed growth?	____	____	____	____	
- Burrowing animal damage?	____	____	____	____	
- Seepage near outside toe of berms and around pipes through the berm?	____	____	____	____	
- Berms, ditches, and roof drains for limiting clean water access to yard	____	____	____	____	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
B.	**If Runoff is Contained in Overland flow or in Infiltration Area or Wetlands ("High-Moderate" or "Moderate-low" risk response for "Type of runoff control system")**				
Grassed infiltration area design	No science based design procedures were followed in determining grassed infiltration area.	Grassed infiltration area is designed to allow infiltration of 25-year, 24-hour storm event.		Grassed infiltration area is designed to allow infiltration of 25-year, 24-hour storm event and provide plant removal of runoff nutrients.	N P Pa SS A O
Excess water	Excess water is released into surface water	Excess water is released into ditch, waterway, or ravine.	Excess water is released into crop or pasture land	Grassed infiltration area is bermed allowing no water discharge. OR Constructed wetland is designed to allow no water discharge.	
Water flow distance from infiltration area or constructed wetland to: - Nearest surface water - Tile line - Surface inlet to tile line - Agricultural drainage well - Sinkhole *(X is the minimum separation distance that is either recommended or required from manure storage to surface water)*	Less than 2X ____ ____ ____ ____ ____	Between 2X and 4X ____ ____ ____ ____ ____	Between 4X and 8X ____ ____ ____ ____ ____	Greater than 8X ____ ____ ____ ____ ____	
Harvesting of plant growth	Grass, hay or other crop material is not harvested.	Grass, hay or other crop material is harvested infrequently.		Grass, hay or other crop material is harvested and removed at least annually.	
Grass filter surface	Grass filter contains ruts due to wheel traffic or erosion causing channel flow.			Grass filter surface is maintained free of ruts and erosion to encourage sheet flow.	
Cleaning/scraping yards	Monthly or less often	Weekly	Every 3 days	Daily	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
C.	**If runoff is not contained ("High" risk response for "Type of runoff control system")**				
Water flow distance from yard to:	Located in yard or along border of yard.	Less than 20X	Between 20X and 50X	Greater than 50X	
-Nearest surface water	____	____	____	____	
-Tile line	____	____	____	____	
-Surface inlet to tile line	____	____	____	____	
-Agricultural drainage well	____	____	____	____	
- Sinkhole	____	____	____	____	
(X is the minimum separation distance that is either recommended or required from manure storage to surface water)					
Slope of land between open lot and surface water	>5%	2-5%		0-2%	
Cleaning/scraping yards	Monthly or less often	Weekly	Every 3 days	Daily	

Feed / Silage Spillage and Leachate

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Distance from silage storage to nearest surface water source	Less than 100 feet OR leachate drains into road ditch or surface water.	100 to 500 feet.	Greater than 500 feet.	Silage effluent is collected and stored for field application.	
Leachate collection system	No silo seepage collection system exists. OR Collected seepage is directed to a ditch or farmstead drainage system.	Seepage drains to a grass filter strip or other permanent vegetation that is >500 ft. from a water course	Has designed system for low flow rates of seepage for subsequent field application. High flows go to properly designed vegetated filter area.	Has designed collection system for all silo seepage and contaminated runoff.	N P SS A O
How is clean drainage water around silo collected?	Footer drain collects silage seepage and outlets within 200 ft. of a watercourse.	Footer drain collects silage seepage and outlets it on the ground (greater than 200 ft. from a watercourse).	Functioning footer drains collect sub-surface water and surface water diversions prevent most clean surface and groundwater from entering the silo without collecting dirty water.	Functioning footer drains collect sub-surface water, and surface water diversions prevent all clean surface and groundwater from entering the silo without collecting dirty water.	
Are there noticeable seepage leaks through cracks or holes in silo floors, walls, or foundations?	Yes			No	
Are there other high-moisture commodities (corn gluten feed, brewer's grains, etc.) stored?	Yes, with no runoff controls			No OR Yes, but stored in contained storage	
Is there a well-maintained roof over the silo?	No			Yes	N P SS A O $
What is the typical moisture content of silage stored in horizontal silos?	Over 80%	76-80%	70-75%	Below 70%	
What is the typical moisture content of silage stored in tower silos? --40 ft. and under? --above 40 feet?	Over 75% Over 70%	71-75% 66-70%	65-70% 60-65%	Below 65% Below 60%	

Wash Water

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What is the management of wash water (excluding cleanup water directed to manure storage)?	Manure, excess feed, and other agricultural products are washed down drain.	Some biodegradable solids are washed down drain.		Manure, excess feed and other solids are removed from floor before washdown. AND First rinse is collected; no Agricultural products enter the system	
What is the method of storage, treatment, or disposal of wash water?	Dry well or stone pit; OR Dumped on soil surface; OR Disposal in field tile, ditch or surface water; OR Septic system with water coming to the surface; OR Septic system in very permeable soils (sand or gravel).	Farm size has increased beyond the designed capacity of the system, but the system appears to be working. OR Septic system of unknown design with no water from the leach field reaching the surface. OR Mixed with manure for daily spreading.	Properly designed and maintained septic system and no water reaching surface.	Properly designed, sized, and maintained: --aerobic lagoon, --settling tank and vegetative filter area, --organic matter bed, --constructed wetland, and --manure storage.	     
Is first rinse water collected and fed?	No			Yes	
Is the amount of wash water flow known and less than the industry average?	Amount of wash water flow is not known	Amount of wash water flow is known, but is above the industry average.		Amount of wash water is known and is below the industry average.	
Is human waste treated separately?	No			Yes	
Is your water tested/treated for hardness? Are you measuring and using proper amounts of system cleaners?	No			Yes	
Distance of discharge, absorption field, or infiltration area from drinking water well.	Well is within 100 feet.	Well is 100 to 250 feet, AND downslope or at grade.	Well is more than 250 feet, AND downslope or at grade.	Well is more than 100 feet, AND upslope.	
Distance of discharge, absorption field, or infiltration area from nearest surface water source.	Less than 100 feet.	100 to 199 feet.	200 to 500 feet.	Greater than 500 feet.	
Pretreatment of effluent before discharge to soil absorption bed/field.	No			Yes	
Storage/settling tank liner	No liner to prevent seepage.	Cracked or porous liner.		Concrete, clay or plastic lined.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Solids cleaned out from settling tank	Tank never cleaned.	Annual cleaning.	Tank cleaned every 6 months.	Tank cleaned as needed or every 3-4 months.	
Final Disposition of wash water treatment Effluent: (Select one of the following five systems that best matches farm's disposal of effluent.)					
Field application by irrigation	Applied to permanent vegetation at more than 54,000 gallons per acre per week (2 inch rainfall equivalent). Vegetation not removed.	Applied to cropped or grazed land at 27,000-54,000 gallons (1-2 inch rainfall equivalent) per acre per week.	Applied to permanent vegetation at less than 27,000 gallons (1 inch rainfall equivalent) per acre per week. Vegetation not removed.	Applied to cropped or grazed field at 27,000 gallons (1 inch rainfall equivalent) per acre or less per week.	
Surface flow	Discharged to ditch, drainage, or stream; OR Applied in sheet to highly or moderately permeable soil. Vegetation not removed.	Applied in sheet to slowly permeable soil. Vegetation not removed.	Applied in sheet to slowly permeable soil. Vegetation sometimes removed.	Applied in sheet to slowly permeable soil. Vegetation regularly removed.	
Slow surface infiltration	No pretreatment. 1 foot of medium- or fine-textured soil above bedrock or high water table. Vegetation not removed.	Some pretreatment. Medium- or fine-textured soil more than 2 to 3 feet over bedrock or high water table. Vegetation not removed.	Combined with high-level pretreatment. Medium- or fine-textured soils more than 3 feet to water table or bedrock. Extended rest period between loadings. Vegetation removed.	Combined with high-level pretreatment. Medium- or fine-textured soil more than 10 feet to water table or bedrock. Extended rest period between loadings. Vegetation removed.	
Subsurface absorption field	Located on medium or coarse-textured soil (silt loam, loam, sands, sandy loam) less than 5 feet to water table or creviced bedrock. No air allowed to enter subsoil.	Located in deep medium-textured soil (silt loam, loam). Soil dries every few weeks.	No medium or low risk options. System has at least a moderate chance of nitrate pollution. This is not a recommended practice.		
Rapid surface infiltration	No pretreatment. Sandy loam or loamy sand soil less than 5 feet thick. Vegetation not removed.	Combined with high-level pretreatment. Sandy loam or loamy sand soil 5 or more feet thick. Vegetation removed regularly.	No medium or low risk options. System has at least a moderate chance of nitrate pollution. This is not a recommended practice.		

Manure and Waste-water flow from Barn and Farmstead

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What is the vegetated flow distance from the manure or waste-water flow from Barn and Farmstead to the nearest water course?	Less than 100 ft.	Between 100 and 200 ft.		There is no flow	N P Pa SS A O
Do leaking waterers add the potential for manure or waste-water flow?	Yes			Waterers are well maintained OR Water flow from barn is contained	
Are there drains in the barn?	Yes			No	
Are traffic areas coming in and out of the barn kept free of mud and manure?	No			Yes	

Stormwater

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What is the potential for Storm-water runoff from your facilities?	The ratio of permeable area (vegetated) to impermeable areas (Roof and paved or graveled areas) is less than 1	The ratio of permeable area (vegetated) to impermeable areas (Roof and paved or graveled areas) is less than 2	The ratio of permeable area (vegetated) to impermeable areas (Roof and paved or graveled areas) is less than 3	The ratio of permeable area (vegetated) to impermeable areas (Roof and paved or graveled areas) is greater than 4	
Are surface water ditches, culverts, and waterways designed to handle the flows?	Flooding occurs frequently or gully erosion is evident		No flooding or erosion occurs	Storm water system designed by professional engineer	SS
Runoff Quality	Storm water carries sediment or manure or Feed			Storm-water is clean	A
Erosion control	Surface water systems have active gullies			All surface water systems are protected from erosion	
Sediment control	Sediment from the storm waters enters ponds, streams or wetlands			Any sediment is settled out in a designed and maintained sediment basin	

Pathogens

Pathogens vary in their response to the environment. Different species and stages of growth have different pathogen issues. In general younger animals are more susceptible to disease.

Poultry Issues?

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Is the farm participating in a pathogen control program?	Not participating			Participating in program	
How is housing managed between groups of animals?	Housing is not washed AND Flooring is not dried or rotated between occupancy.	Housing is not washed. OR Flooring is not dried or rotated between occupancy. OR New surfaces are not applied to gravel-floored animal areas.	Housing is pressure washed and air-dried for 2 weeks between groups AND floors of housing are cleaned. OR New surfaces are applied to gravel-floored areas.	Housing is steam-cleaned AND flooring of housing is cleaned and air-dried for 2 weeks between groups. OR Pens are moved to a location where the base has been exposed to 4 full days of sun drying	
Are animals and bedding kept clean?	Most animals have manure stains or caked manure on them and manure is present in bedding. Your knees get wet and dirty if you kneel on the bedding. AND Bedding is not changed between animals/groups.	Some animals have manure stains or caked manure on them and some manure is present in bedding. Your knees get wet if you kneel on the bedding. OR Bedding is not changed between animals/groups.	Most animals are clean and most of the bedding is clean and dry. Your knees may get damp if you kneel in the pens. AND All bedding is changed between animals/groups.	All animals are clean and all bedding is clean and dry. AND All bedding is changed between animals/groups.	
Are feeding supplies clean?	Feed and watering buckets are not cleaned between feedings. AND Oldest animals are fed first. AND Feed is allowed to mix with manure on the ground.	Feed and watering buckets are not cleaned between feedings. OR Oldest animals are fed first. OR Feed is allowed to mix with manure on the ground.	Feed and watering buckets are cleaned between feedings. Feeding buckets are shared by youngest animals are fed first. AND Feed is not allowed to mix with manure on the ground.	All feed and watering buckets are cleaned and dried between feedings. Each animal has its own individual feed utensils or bucket. AND Feed is not allowed to mix with manure on the ground.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Is surface water allowed to enter or flow through housing facilities?	Surface water is contaminated with manure AND less than 100 ft. of permanent vegetation filter area is maintained between housing facility and surface watercourse.	Surface water is contaminated with manure AND a 100-199 ft. permanent vegetation filter area is maintained between housing facilities and any watercourse.	Surface water is not contaminated with manure AND there is at least a 200 ft. permanent vegetation filter area between housing facility and any watercourse. Runoff is contained by berms.	All surface water is diverted away from housing facilities AND runoff from housing area is contained or diverted to storage.	
How is manure from young animals handled and stored?	Young animal manure is handled separately AND stored less than 6 months.	Young animal manure is mixed with the rest of herd manure AND stored less than 6 months.	Young animal manure is mixed with the rest of the manure AND stored at least 6 months in an appropriate storage facility. OR Young animal manure is handled separately from the rest of herd manure AND completely composted at an appropriate site.	Young animal manure is mixed with the rest of herd manure AND completely composted at an appropriate site.	Pa $
How is manure from young animals land-applied?	Young animal manure is sometimes applied to land areas subject to flooding, runoff, leaching, or movement into tile drains.		Young animal manure is not spread on frozen or snow-covered ground, or on areas prone to flooding, or when hydrologically sensitive.	Young animal manure is completely composted prior to land application AND Young animal manure is not spread on frozen or snow-covered ground or on areas prone to flooding or when hydrologically sensitive.	
Do animals have contact with people who are knowledgeable about biosecurity controls?	Animals have frequent contact with outsiders who are not familiar with biosecurity controls	Some, but not all, employees are trained in animal care and biosecurity controls		All employees are trained in animal care and biosecurity controls	
Is animal production on farm seasonal or continuous?	Animal production is continuous, with housing areas in constant use and not thoroughly cleaned and sun-dried between animals.		Animal production is continuous, but calves are rotated across locations in order to allow previously used areas to be thoroughly cleaned and sun-dried prior to receiving new animals.	Animal production is seasonal, allowing for thorough cleaning of housing areas	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Are animal housing facilities well ventilated?	There is poor ventilation, allowing for the facilities to smell of ammonia AND The air is humid			There is adequate ventilation	
How are sick animals handled	They are kept with the rest of the animals AND Are handled first			Sick animals are separated and handled last	
In what order are different age animals handled?	Oldest animals are handles first			Youngest animals are handled first	
Do animals have contact with other manure? OR Is manure spread by handler's boots, clothing, equipment or runoff?	Yes			No	
Are pets and pests (especially rodents) present in the housing area?	Yes			No	
Do visitors wear plastic boots or follow other biosecurity practices to avoid bringing pathogens onto the farm?	No			Yes	
Are animals brought on from other farms certified pathogen free or quarantined?	No			Yes	
Is equipment from other farms disinfected before entering?	No			Yes	

Odor Control

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Review community siting worksheet (Page 10). Are any towns, residences, churches, etc. at high-risk for noticing odors generated from your feedlot?			No high-risk neighbors identified in community siting worksheet.		
Have you received complaints from neighbors about odors or dust from the feedlot?	Several complaints within the past year.	Occasional complaints within recent years.		Never	
Have you ever asked neighbors about odor or dust concerns?	No	Some of the neighbors have been approached.		All of the neighbors have been approached.	
Homes, public use areas, or businesses.... Distance:	300 a.u. and less...< 1/4 mile More than 300 a.u. ... < 1/2 mile	300 a.u. and less... 1/4 to ½ mile More than 300... ½ to 1 mile	300 a.u. and less ... 1/2 to 1 mile More than 300 a.u. ... 1 to 2 miles	300 a.u. and less ...> 1 mile More than 300 a.u. ...> 2 miles	
Direction:	Neighbors are located downwind for prevailing spring, summer or fall winds		Neighbors are located downwind for prevailing winter winds only	Neighbors are not located downwind for prevailing winds at any time of year	
Elevation:	Neighbors are located at lower elevation than storage and in valley	Neighbors are located at lower elevation than storage but in open area	Neighbors are located at similar elevation with storage and in open area	Neighbors are located at higher elevation than storage. Sizeable hill, shelterbelt or other change in typography lies between neighbor and storage.	
Visibility:	Facility is highly visible due to location close to road.	Facility is recessed from neighbors and road but visible.	Only neighboring residents are aware of facilities due to partial screening	Typography and vegetation visually screens facility.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits)
Relative odor risk associated with alternative types of manure storage systems	Formed manure storage, earthen storage basin, or undersized anaerobic lagoon	Properly-sized anaerobic lagoon OR Partially covered manure storage OR Open lot runoff holding pond OR Dry manure storage where liquids are separated and drained to separated storage or absorbed by bedding.		Anaerobic digester or other treatment system is included with any manure storage OR Purple anaerobic lagoon OR Composted manure storage OR Manure is stored for less than one week before land application. Properly covered manure storage.	
Indoor Confinement Animal Housing					
Manure is handled as a :	Slurry or liquid		Solid with limited dry organic matter additions.	Solid with substantial dry organic matter additions.	
Rate (by checking appropriate response) the cleanliness of your animal housing relative to that of other similar production facilities for:	Not as clean as other facilities	At least as clean as typical facilities		As clean or cleaner than all other facilities	
- Cleanliness of animals					
- Manure and feed accumulation on floors and walkways.					
-Feed spillage (Outdoors)					

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Rate the drainage around your animal housing relative to that of other similar production facilities.	Not as dry as other facilities.	At least as dry as typical facilities.		As dry or drier than all other facilities.	
Is manure controlled and collected?	Some manure regularly pools or accumulates in areas around the animal housing.	Some manure occasionally pools or accumulates in areas around the animal housing.		All manure is contained within housing and not allowed to collect around animal housing.	
Frequency of manure and waste feed removal?	Less than one per week	Weekly		Manure is flushed or scraped from a facility at least once a day OR Animals are heavily bedded to maintain dry conditions.	 
Dust from confined facilities	Dust regularly builds up on fans or ventilation outlets	Few efforts have been made to control dust		No dust problems exist	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Barnyard or Open Lot Animal Housing (Odor and Dust Management)					
Open Lot Design					
- Barnyard or Feedlot slope	No slope, or slope is toward feed apron or other feed areas.	Slope is less than 3% away from feed apron or other feed areas.		Slope is 3 to 5% away from feed apron or other feed areas.	
- Adjacent pens	Pen to pen drainage is common.	Pen to pen drainage occurs in a few pens.		No pen to pen drainage exists	
- Barnyard or Feedlot shape	Pens are irregularly shaped and not conducive to edge-to-edge manure removal.			Pen shape allows edge-to-edge manure removal. Curbs are installed to assist clean-up.	
- Barnyard or Feedlot surface?	Barnyard or Feedlot soil are easily erodible and prone to rills and gullies.	Barnyard or Feedlot surface is soil treated with stabilizer, or constructed of firm, stable soil.		Barnyard or Feedlot surface is concrete.	 
- Drainage from corral?	Downstream barnyard or feedlot surfaces are part of the runoff storage pond.	Downstream barnyard or feedlot surfaces are prone to temporary flooding.		Downstream barnyard or feedlot surfaces quickly drain after a storm event.	
- Runoff control?	Significant manure or run off is not controlled and regularly pools in areas around open lots.	Some manure and runoff is not controlled and regularly pools in areas around open lots.	Runoff goes to vegetation filter area.	All manure/runoff is contained within runoff control pond.	
- Vegetative barrier	No vegetative barrier is located down wind of barnyard or feedlot based upon prevailing winds during times of year of high dust or odor concerns.			A dense shelter belt or other vegetative barrier is located down wind of barnyard or feedlot based upon prevailing winds during times of year of high dust or odor concerns.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Open lot management					
- Frequency of manure removal:					
Arid climate:	Less than twice a year	120 day intervals		Every sixty days or less	
Humid climate:	Monthly	Weekly		Daily	
- Operator training in manure removal and pen management.	No employee training is offered.		Managers are knowledgeable in techniques of manure removal and motivation for this practice.	All appropriate employees are trained in techniques of manure removal and motivation for this practice.	 
- Pen surface management	Holes, pits, or depressions are not regularly corrected.	Holes, pits, or depressions are corrected only at time of manure removal (commonly several months between manure removal)	Frequent inspection of pen surfaces are made. Few holes, pits or depressions exist for collection of water. Wet areas quickly corrected	Concrete surface	 
- Water leakage	Overflow waterers and system leaks are not a priority.	Inspections for overflow waterers and system leaks are infrequent.		Regular inspection are made for overflow waterers and system leaks Problems are quickly corrected.	 
- Manure ridges at fence lines.	Removal of manure ridges is not a priority		Manure ridges are removed with each pen cleaning.	Curbs are installed to assist in scraping.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
In arid areas: During periods of dust problems, the following dust control measures are possible: - Dry manure and dust harvested frequency, - Daily watering of corral surfaces, - Cross-fencing to increase stocking density, - Topical application of crop residue on corrals.	Less than twice a year AND No additional dust control measures are implemented	Manure is harvested frequently (every 120 days under normal conditions and every 30 days under dry conditions) AND Barnyard/feedlot watering, cross fencing, or topical application of crop residue is implemented on at least 50% of occupied lots under dry conditions.		Manure is harvested at least every 60 days (30 days under dry conditions) AND Barnyard/feedlot watering, cross fencing, or topical application of crop residue is implemented on at least 80% of occupied lots under dry conditions.	

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing all worksheets, identify the over-all strengths and weaknesses of your system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Activities	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Term Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	
Long Term Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

Activities	Years in Which Significant Progress is Made Towards Goal?	Year in Which Goal is Accomplished?
Short Term Goals or Changes		
1. _____		
_____		
2. _____		
_____		
3. _____		
_____		
Long Term Goals or Changes		
1. _____		
_____		
2. _____		
_____		
3. _____		
_____		

Review of Options:

For additional information please see the following publications which are available at Natural Resource, Agriculture, and Engineering Service (NRAES) web site (WWW.NRAES.ORG) and at the MidWest Planning Service (MWPS) web site (WWW.MWPSHQ.ORG).

General Agriculture

- International Conference on Air Pollution from Agricultural Operations. MidWest Plan Service, 1996. 488 pages $35.00
- Managing and Designing Bunker and Trench Silos. MidWest Plan Service, 1997. 18 pages $4.00
- Silage: Field to Feedbunk.. Proceedings from the Silage: Field to Feedbunk Conference, 1997. 464 pages $30.00
- Silage and Hay Preservation. NRAES, 1990. 53 pages $9.00
- Silage Production from Seed to Animal. Proceedings from the Silage Procudtion from Seed to Animal National Conference, 1993. 302 pages $30.00

Livestock and Poultry

- Beef Cattle Handbook. MidWest Plan Service, 1999. CD-ROM $25.00
- Beef Housing and Equipment Handbook. MidWest Plan Service, 1986. 136 pages $7.00
- Heating, Cooling, and Tempering Air for Livestock Housing. MidWest Plan Service, 1990. 46 pages $6.00
- Mechanical Ventilating Systems for Livestock Housing. MidWest Plan Service, 1990. 68 pages $7.00
- Natural Ventilating Systems for Livestock Housing. MidWest Plan Service, 1989. 30 pages $5.00

Dairy

- Calves, Heifers, and Dairy Profitability: Facilities, Nutrition, and Health. Proceedings from the Calves, Heifers, and Dairy Profitability National Conference, 1996. 378 pages $30.00
- Dairy Freestall Housing and Equipment. MidWest Plan Service, 2000 (7th edition). 160 pages $22.00
- Dairy Housing and Equipment Systems: Managing and Planning for Profitability. Proceedings from the Dairy Housing and Equipment Systems: Managing and Planning for Profitability Conference, 2000. 456 pages $30.00
- Environmental Factors to Consider When Expanding Dairies. NRAES, 1999. 44 pages $9.00
- Guideline for Milking Center Wastewater. NRAES, 1998. 34 pages $8.00
- Guideline for Planning Dairy Freestall Barns. NRAES, 1995. 52 pages $8.00
- Natural Ventilation for Dairy Tie Stall Barns. NRAES, 1998. 7 pages $3.00
- Tunnel Ventilation for Dairy Tie Stall Barns. NRAES, 1998. 15 pages $4.00

Manure and Waste Management

- Dairy Manure systems: Equipment and Technology. Proceedings from Dairy Manure Systems: Equipment and Technology Conference, 2001. 424 pages $30.00
- Waterborne Pathogens in Agricultural Watersheds. NRAES, 2001. 68 pages $9.00
- Anaerobic Digesters for Dairy Farms. Cornell University, Agricultural and Biological Engineering Department, 1990. Available from NRAES. 72 pages $10.00
- Animal Agriculture and the Environment: Nutrients, Pathogens, and Community Relations. Proceedings from the Animal Agriculture and the Environment Conference, 1996. 386 pages $30.00
- Guideline for Dairy Manure Management from Barn to Storage. NRAES, 1998. 36 pages $8.00
- Livestock Waste Facilities Handbook. MidWest Plan Service, 1993. 112 pages $8.00
- Managing Nutrients and Pathogens from Animal Agriculture. Proceedings from the Managing Nutrients and Pathogens from Animal Agriculture Conference, $30.00

- Poultry Waste Management Handbook. NRAES, 1999. 72 pages $16.00

Composting

- Field Guide to On-Farm Composting. NRAES, 1999. 128 pages $14.00
- On-Farm Composting Handbook. NRAES, 1992. 186 pages $25.00
- On-Farm Large-Scale Chicken Carcass Composting. NRAES, 1997. 10-minute Video $15.00

Private Drinking Water

- Private Drinking Water Supplies: Quality, Testing, and Options for Problem Waters. NRAES, 1991. 60 pages $8.00
- Private Water Systems Handbook. MidWest Plan Service, 1979. 72 pages $7.00

Acknowledgements

Farmstead Facilities: Multimedia Concerns

Table of Contents

Introduction

Objective

The goal of this assessment package is to help a livestock or poultry producer confidentially evaluate their farmstead facilities on issues that relate to various materials that can impact the environment. This package will assist in:

- Assessing your operation's compliance with commonly regulated issues
- Minimizing impact of agricultural activities on water quality near your facilities
- Reducing the likelihood of environmental complaints
- Setting priorities for improved environmental practices.

Environmental Benefits

Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

Reduce Nitrogen risk

Reduced Phosphorus risk

Reduced Pathogen risk

Improved Farm Aesthetics

Reduced Hazardous Waste

Reduced Suspended Solids risk

Reduced Ammonia emission

Reduced Odor risk

Financial Benefits

Why Should I Be Concerned?

Many products that are used on a farm help to meet production goals. However, if improperly used, and stored or disposed of, they can allow bacteria, nitrates, pesticides, petroleum, or other products to contaminate ground and surface water. These contaminants can put your family, neighbors, and livestock health at risk.

Pesticides, fertilizers and water play an important role in maintaining a successful landscape. Pesticides control undesirable weeds, insects, diseases and rodents; fertilizers increase the fertility of the soil to enhance the growth of the plants. Water is essential for the very life of the plants. However, if pesticides and fertilizers are not used properly there is potential for ground and surface water to be contaminated. Malfunctioning septic tanks can also cause substantial risk to drinking water. Preventing contamination of your well is very important. Once the ground water supplying your well is contaminated, it may be very difficult and costly to clean. The only options may be to treat the water, drill a new well or obtain water from another source. A contaminated well can also affect your neighbors' wells and pose a health threat to your family and neighbors.

Farms and households generate waste that may exhibit one or more characteristic of a hazardous waste. Many common farm and household products, such as paints, solvents, oils, cleaners, wood preservatives, and batteries, may be classified as hazardous. This waste, if improperly used, stored or disposed of, can be harmful to human and animal health and can contaminate ground and surface water.

How Do I Proceed?

This assessment is broken into four major sections:

- *Regulatory Compliance Review* looks at the regulations that your operation should comply with and assesses your knowledge of and compliance with these regulations.
- The *Site Review* that should provide you with a better understanding of the environmental risks associated with the facilities' site characteristics. While these characteristics may be difficult to modify, your understanding of these risks will allow you to manage the operation to reduce environmental impacts.
- The *Systems and Management Review* is broken into several worksheets on different topics. This section is meant to highlight practices on your farm that present risks to the environment. After each worksheet there is a Strengths and Weaknesses section, which you can fill out in order to identify your strengths and weaknesses in the worksheets topic.
- After completing each of the worksheets you will be ready for the *Identification of Strengths, Weaknesses, and Priorities* section, which is meant to encompass all of the topics. You will be requested to review the issues that have been raised throughout the manure and related effluents assessment and develop a plan for continuous improvement.
- The final section is called *Review of Options*. This section provides you with more detailed tools, options for improvement and references. Many of these tools may be referenced in the assessment portion while other may simply provide for a more detailed analysis of certain aspects of your operation.

Remember, the goal of this tool is to help you identify high-risk situations through a voluntary assessment. If you do not want to complete certain portions, or are unsure of your answers, feel free to either seek further assistance from trained professionals or simply skip that question. Hopefully, the tool will help you to not only identify environmental risks and where you have done a good job of environmental stewardship, but also help you improve the profitability and sustainability of your operations.

1. For each issue listed (left hand column) in the "Regulation Compliance Review: Farmstead Facilities – Multimedia Concerns" worksheets, identify if this issue is regulated by federal, state, or local authorities to which you are responsible (middle column), and determine if your facilities are in compliance with these rules (right hand column).

2. For each issue listed in the left-hand column of the "Worksheets", read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

3. In the *Identification of Strengths, Weaknesses, and Priorities section*, identify the strengths and weaknesses of the farmstead's manure and related effluent issues. Based upon these strengths and weaknesses, identify the changes planned for reducing your operations environmental risks. Establish a preliminary estimate of the resources required for implementation of this change and the date you plan to have it implemented.

Acknowledgements

Assessment tools from numerous authors and organizations were reviewed in the development of the livestock and poultry environmental assessment tools assemble in this module. Most notable were assessment tools from:

Livestock and Poultry Environmental Stewardship curriculum,
New York State Agricultural Environmental Management project,
National Farm*A*Syst project,
Nebraska Farm*A*Syst project,
Iowa Farm*A*Syst,
Georgia Farm*A*Syst
NRAES-87 Home*A*Syst

The Livestock Environmental Management Systems Teams that assembled this module is deeply grateful to the many individuals and organizations who allowed us to modify and use their assessment tools.

Regulatory Compliance Review: Farmstead Facilities – Multimedia Concerns

Instructions: The goal of this assessment tool is to help a producer identify regulatory issues that may apply to their operation. For each issue listed (left hand column) on the worksheets, identify if this issue is currently regulated, and determine if your operation is in compliance with these rules (right hand column).

Regulatory Issue	Is this issue addressed by regulations? If "Yes," summarize those regulations.	Is my operation in compliance?
General Regulations		
Are there regulations regarding the disposal of medical waste on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning the disposal of dead animals on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there dust regulations concerning your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning flies and rodents on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning the disposal of oily or greasy plastic containers?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning the use and disposal of anti-freeze on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning the use of a burn barrel on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning noise on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are your employees required to be certified in _____?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations concerning shop drains for your operation?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to inspect any of the following facilities?		
Pesticide storage?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No
Fertilizer storage?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No
Petroleum storage?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No
Are there regulations controlling the use of certain fertilizers on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Regulatory Issue	Is this issue addressed by regulations? If "Yes," summarize those regulations.	Is my operation in compliance?
Are there regulations controlling the use of certain pesticides on your facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Separation Distances		
Are there any required setbacks or separation distances from your pesticide, fertilizer, petroleum, and solid waste storage and handling facility to...		
Property lines?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Residences?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Surface Water?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Public facilities?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Highways?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Wells?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Sinkholes?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
_____?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
_____?	___ Yes ___ No; If yes, how far?	___ Yes ___ No
Other?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Drinking Water		
Are you required to test for water quality in the following?		
Wells?	___ Yes ___ No If Yes, summarize	___ Yes ___ No
Streams?	___ Yes ___ No If Yes, summarize	___ Yes ___ No
Surface waters?	___ Yes ___ No If Yes, summarize:	___ Yes ___No
Are you required to keep records of inspections for the following?		
Wells?	___ Yes ___ No If Yes, summarize	___ Yes ___ No
Septic system?	___ Yes ___ No If Yes, summarize	___ Yes ___ No
Streams?	___ Yes ___ No If Yes, summarize:	___ Yes ___No
Other surface water?	___ Yes ___ No If Yes, summarize:	
Other?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Site Review:
Manure Storage and Related Effluents

General:

List each farmsite on your farm	Type of material used, stored or disposed of at site	Amount
1.		
2.		
3.		
4.		
5.		

Site Assessment: Identifying Community and Odor, and Water Quality Concerns

Maps: A map is recommended for each farmstead showing where materials are stored or disposed of. You may do this by adding to the specific Farmstead Site Assessment from the Farmstead Facilities: Manure and Related Effluents tool if available.

Farmstead Facilities Map

Purpose: These maps will provide a framework for identifying potential farmstead sources of ground and surface water contamination from hazardous materials. The attached grid can be used for mapping these concerns. Some permit processes require that water quality related issues must be illustrated on a USGS Quadrangle map or appropriate equivalent. Copies of quadrangle maps are available through local USDA Natural Resource Conservation Service offices.

Instructions: Fill out a copy of the attached diagram or a quadrangle map for each farm site.

Land Features:

Legend

Location of surface water and other hydrologically sensitive areas, including

- perennial (continuous) streams,
- intermittent streams,
- drainage tiles,
- drainage ditch
- Small pond, reservoir or wetland;
- Runoff flows

Well or sinkhole locations shallow to bedrock (mark abandoned or dry wells as such)

W S

Conservation measures

- grassed waterway
- Other (e.g. buffer areas, or grass strip). Clearly label each conservation practice.

Buffer Area

Farm property boundary

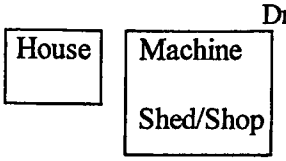
- Wind Breaks

Farmstead Features:

- Confinement Barn and Open Lots/ Barnyards

CB OL/BY

- House and other buildings



- Slope/direction of water flow

- Silage storage/silo (SS)

- Roads

- Location of pesticide (P), fertilizer (F), fuel (Fu) and other hazardous material, storage, and mixing/loading areas.

- Waste disposal (WD) sites (burn barrel, dump)

- Mortality (M) sites

Farmstead Facilities Example Map

1 box = _____ feet

Farmstead Facilities Map

1 box = _____ feet

Systems and Management Review: Environmental Planning

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Do you have an emergency action plan in case one of the following spills?	No Plan Exists	A plan exists, but it is not known by employees		A plan exists, and it is known by all employees	
- Pesticides	____	____		____	$
- Fertilizer	____	____		____	
- Petroleum	____	____		____	N
- Other	____	____		____	
Do you have a Standard Operating Procedure (SOP) for each of these issues?	No			Yes, and employees are trained and follow it	P
Drinking Water Supply	____			____	Pa
Household Waste	____			____	H
Pesticide Management	____			____	
Fertilizer Management	____			____	O
Fuel Storage	____			____	
Medical Disposables	____			____	A
Mortality Management	____			____	
Solid Wastes	____			____	SS
Hazardous Materials and Other Waste Management Issues	____			____	
Nuisance Issues Control	____			____	NH_3

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Do you have a record keeping and/or monitoring system for inventory control for each of these?	No			Records are organized and complete	
Drinking Water Supply	____			____	
Household Waste	____			____	
Pesticide Management	____			____	
Fertilizer Management	____			____	
Fuel Storage	____			____	
Medical Disposables	____			____	
Mortality Management	____			____	
Solid Wastes	____			____	
Hazardous Materials and Other Waste Management Issues	____			____	
Nuisance Issues Control	____			____	

Drinking Water Supply

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environment Benefits
What is the type of water supply	Dug well or spring development	Driven-point (sand point)	Drilled Well	Municipal	
What is the age of the water supply system?	More than 80 years old	51-80 years old	21-50 years old	Less than 20 years old	
What water testing is done?	No water tests done, OR tests indicated bacteria, nitrate, or other contaminants frequently above standards. Noticeable changes in color, clarity, odor, or taste after rainstorms, spring melt, or other times.	Irregular testing. Bacteria, nitrate and other tests do not meet standards some of the time.	Regular testing. Record of increased levels of nitrates and other contaminants, but still meet standards.	Regular testing (at least annual). Records indicated consistent, satisfactory water quality. Bacteria, nitrate, and other tests meet standards.	Pa
How often is the water supply inspected?	Never inspected.	Inspected every 5 years.	Inspected every 3 years.	Water supply and plumbing system inspected annually and records are kept of maintenance performed.	N
Position of drinking water in relation to pollution sources	Settling or depression near casing. Surface water runoff from livestock yard, pesticide and fertilizer mixing area, fuel storage, or farm dump reaches well.	Downslope from most pollution sources. Some surface water runoff may reach well.	Upslope from or at grade with pollution sources. No surface water runoff reaches well.	Upslope from all polution sources. No surface water runoff reaches well. Surface water diverted from well.	H
Soil and/or subsurface potential to protect groundwater	Coarse-textured soils (sand. Loamy sand) or water table or fractured bedrock shallower than 20 feet.	Coarse or moderately coarse textured soils (sandy loam). Water table or fracture bedrock deeper than 20 feet.	Medium-textured soils (loam, silt loam). Water table or fractured bedrock deeper than 20 feet.	Fine-textured soils (clay, clay loam, silty cloay loam) and water table or fractured bedrock deeper than 20 feet.	
Are the parts of your facility that come in contact with manure and run-off located on a floodplain?	Yes, and the area floods frequently	Yes, and the area flood occasionally	Yes, but the area only floods rarely	No	

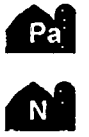
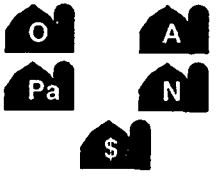
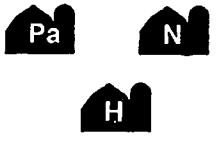
	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environment Benefits
How far is your drinking water source from the:	Less than X	Between 1X and 2X	Between 2X and 3X	Greater than 3X	
Septic tank?	____	____	____	____	
Cesspool or seepage pit?	____	____	____	____	
Manure storage structure (fabricated)?	____	____	____	____	Pa
Manure storage structure (earthen)?	____	____	____	____	
Manure stack?	____	____	____	____	N
Unused or abandoned barnyard/feedlot?	____	____	____	____	
(X is the minimum separation distance that is either recommended or required from drinking water sources to the above hazardous waste sites)					
What backflow precautions are in place?	No-anti-backflow devices. Air gap not maintained. Cross-connections exist between water supplies.	No anti-backflow devices. Air gap maintained. No cross-connections between water supplies.	Anti-backflow devices installed on some faucets with hose connections. Air gap maintained. No cross connections between water supplies.	Anti-backflow devices (such as check valves) installed on all faucets with hose connections. Air gap maintained. No cross-connections between water supplies.	Pa N H
Farm Wells					
What is the Depth of the well?	Less than 20 feet			Greater then 100 feet	
Condition of casing and well cap (seal).	Holes or cracks visible. Cap loose or missing. Can hear water running.	No holes or cracks visible. Cap loose.	No defects visible. Cap tightly secured. Well vented but not screened.	No holes or cracks. Cap tightly secured. Screened vent.	Pa
Annular space seal	No grout seal. (illegal for new wells in some states)	Grout seal missing or less than required depth. (illegal for new wells).		Required annular space grout seal is in place.	N
Casing height above land surface	Below grade or in pit or basement. (illegal for new wells)	At grade or up to 8 inches above. (illegal for new wells)	8-12 inches above grade. (illegal for new wells)	More than 12 inches above grade.	H

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environment Benefits
What is the condition of the surface material around the well casing?	Can see settling of surface material around well casing and visible space between well casing and surrounding surface material.	Can see settling of surface material around well casing.	No settling of surface material around well casing and ground sloped away from well casing on at lest a 10:1 slope. No space between well casing and surrounding surface material.	Casing surrounded at the ground surface by a 4' thick concrete slab extending at least 2' in all directions and sloping away from casing.	Pa
What is the extent of grouting?	Major cracks in grout or not grouted.	Some grouting around casing and grout has minor cracks and is beginning to show signs of failure.	Bentonite-based or clay grout to a depth or at least 10'.	Grouted around casing with cement to a depth of at least 20'.	N
Are there any sinkholes, depressions or fractured bedrock near the surface or other wells nearby?	Yes			No	H
Are there unused or abandoned wells on the farms?	Unused or abandoned well in farmstead. Not capped or plugged.	Unused or abandoned well in field. Not capped or plugged.	Unused wells capped and protected. Abandoned wells plugged	No unused, unsealed or abandoned wells.	
Springs					
What is the age of the spring?	>100 years old			Built within past 10 years	
What is the spring's water source?	Surface water			>100 feet below ground water	
Is the water source protected?	No			Spring recharge area is protected	Pa
What is the condition of the spring's covers?	Holes or cracks visible in cover. Surface water can enter.	No holes or cracks visible. Cover is loose.		No holes or cracks. Cover tightly secured. Screened vent.	N

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environment Benefits
Surface Waters					
What does the water look like?	Pea-green, gray or brown water along entire reach; severe algal blooms create thick algal mats in stream.	Greenish water or considerable cloudiness most of the time along entire reach; rocks or submerged objects covered with heavy green or olive green film, especially during warmer months.	Fairly clear or slightly greenish or cloudy water along entire reach; moderate algal growth present.	Clear water along entire reach with a diverse aquatic plant community. AND No noticeable film on submerged objects or rocks.	Pa N
How close to the stream or pond do you normally till?	Right to the edge			A properly maintained and designed buffer area exists between the water and fields.	H
Can your livestock gain access to the stream or pond?	Yes			No	SS
Do your field tile or other drains empty into a stream or pond?	Yes			No	

Septic System, Design and Operation

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Capacity of system	Bathrooms, bedrooms, or water-using appliances are added without reexamining the capacity of the wastewater system.		Capacity just meets load requirements, but I watch out for factors indicating system overload. Water conservation measures are taken.	Tank is designed to handle more wastewater than required based on the size of the home.	
Separation distance *(X is the minimum separation distance that is either recommended or required from drainfield to surface water)*	Drainfield is less than X feet from well or surface water.	Drainfield is between 1X and 2X feet from well or surface water.		Drainfield is greater than 2X from any well or surface water.	
Age of system or holding tank YEAR INSTALLED: _____	System is more than twenty years old.	System is between six and twenty years old.		System is five years old or less.	
Effluent filter	There is no effluent filter installed on the septic tank outlet.	An effluent filter is installed but not cleaned often.		An effluent filter is installed and cleaned regularly.	
Safety devices	There is no alarm to indicate tank overflow or that power has been cut off to the pump.			An alarm on the pumping chamber or holding tank indicated that the tank is full or power has been cut off to the pump.	
Backflow protection	No backflow valve is installed to prevent backup during floods.			A backflow valve is installed to prevent backup during floods.	
Maps and records	The location of my system is unknown. I do not keep a record of pumping and repairs.		The location of my tank and date of last pumping are known but not recorded.	I keep a map and good records of repairs and maintenance.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Tank pumping (including holding tanks)	The septic tank is not pumped. OR The holding tank overflows or leaks between pumpings.	The septic tank is pumped but not regularly.		The septic tank is pumped on a regular basis as determined by an annual inspection, or about every three to five years. The holding tank is pumped as needed.	
Condition of tank and baffles	The condition of the tank and baffles is unknown.			The tank and baffles are inspected for cracks; reparis are made promptly.	
Drainfield protection	Vehicles, livestock, heavy objects, or other disturbances are permitted in the drainfield area.	Occasionally, the drainfield is compacted by heavy objects or activities.		Vehicles and other heavy objects or activities are kept from the drainfield area.	
Diverting surface water	Runoff from land, rooftops, driveways, etc. flows into the drainfield.	Some surface water flows into the drainfield area.		All surface runoff is diverted away from the drainfield.	
Plantings over the drainfield	Trees and shrubs are growing on or near the drainfield.			Grass or other shallow-rooted plantings are over the drainfield.	
Signs of trouble	Household drains back up. Sewage odors can be noticed in the house or yard. Soil is wet or spongy in the drainfield area. Well water tests positive for coliform bacteria.	Household drains run slowly. Soil over the drainfield is sometimes wet.		Household drains flow freely. There are no sewage odors inside or outside. Soil over the drainfield is firm and dry. Well water tests negative for coliform bacteria.	
Solid wastes	There is heavy use of the garbage grinder, and many solids are disposed of down the drain. Many paper products or plastics are flushed down the toilet.	There is moderate use of a garbage grinder, and some solids are disposed of down the drain.		There is no garbage grinder (dispose all) in the kitchen. No grease or coffee grounds are put down the drain. Only toilet tissue is put in the toilet.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Water conservation	Standard high-volume bathroom fixtures are used (toilets, showers). No effort is made to conserve water. Leaks are not repaired.	Some water-conserving steps are taken (such as using low-flow shower heads or fully loading washing machines and dishwashers).		Only water-conserving fixtures and practices are used. Drips and leaks are fixed immediately.	  
Water usage	Several water-using appliances and fixtures are in use in a short period of time.			Laundry and other major water uses are spread out over the week.	
Cleaners, solvents, and other chemicals (also applies to holding tanks)	There is heavy use of strong cleaning products that end up in wastewater. Hazardous chemicals are disposed of in the wastewater system.	There is occasional disposal of hazardous household chemicals in the wastewater system.		There is careful use of household chemicals (paints, cleaning products). No solvents, fuels, or other hazardous chemicals are poured down the drain.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Storage					
What is the condition of pesticide storage containers?	Pesticides are kept in original containers with unreadable or missing labels. OR Pesticides are not stored in original containers, and labels are unreadable or missing.	Pesticides are not stored in original containers, but are stored in appropriate containers with proper, legible labels.		Pesticides kept in original containers with original readable labels.	
What security measures are taken at the storage area?	Area is unlocked, unfenced, AND regularly used for other activities.	Area is unlocked, unfenced, AND used only for pesticide storage.	Area is locked, but not fenced, AND used for pesticide storage only.	Area is locked and fenced, AND used only for pesticides.	
What is the condition of the floor in the pesticide storage area?	Pesticides are stored on permeable floor, e.g. – gravel, dirt or wood.	Pesticides are stored on impermeable floor, with no curbs or dikes to contain leaks. However, pesticides are tub-stored in containers.		Pesticides are stored on impermeable floor (e.g. – sealed concrete) with curbs or dikes to contain leaks.	H
Is there a floor drain in the storage area?	The floor drain does not lead to an acceptable holding tank. OR No floor drain, and pesticides are flushed to the outside.			No floor drain, and pesticide is contained on the floor. OR Floor drains to acceptable holding tank.	
What is done with unwanted or banned pesticides?	Unwanted pesticides are disposed of on the farm OR Are stored on the farm.			Farm participates in the EPA/DEC "return" program. OR Unused pesticide returned to dealer. OR Disposed of through a hazardous waste collection service.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What type of back-flow prevention is used?	No anti-backflow device. No air-gap maintained above sprayers tank, AND water Is taken directly from a well pond or stream.	Reduced pressure zone device in place, OR air-gap is equal to twice the diameter of the filler source pipe above the sprayer tank. AND Water is taken from a drinking water well; OR water is taken from the well then moved away from well to be mixed with pesticide.		Reduced pressure zone device in place OR air-gap equal to twice the diameter of the filler source pipe about the sprayer tank AND water is taken from a source other than a drinking water supply.	
What is the extent of spill/leak containment in the mixing/loading area?	No containment. Spills soak into the ground.	Tank loaded on level, paved driveway or concrete pad.	Concrete pad with curbs AND sump in place to collect and transfer spills/leaks to storage.	Mixing and loading is done at a specified area designed by NRCS or a professional engineer.	
What is the proximity of the mixing/loading area to wells, springs, and watercourses?	Mixing/loading area is sited in an aquifer recharge area OR is within 100 ft. of a watercourse.		Mixing/loading area is not sited in an aquifer recharge area of a well or spring AND Is done further than 100 ft. from any watercourse.	Mixing/loading area is not sited in an aquifer recharge area of a well or spring, AND Mixing and loading is done at least 200 ft. from any watercourse, in a specified area designed by NRCS or a professional engineer.	H
How is sprayer rinse water disposed of?	Sprayer rinsate is dumped on the farmstead.	Rinsate is sprayed along fence lines or other weedy areas.	Rinsate is sprayed back on a crop that the pesticide is labeled for.	Sprayer rinsate is properly stored for use in later applications to crops that the pesticide is labeled for.	
How and where are pesticide containers disposed of?	Unrinsed or partially-filled plastic or paper containers are disposed of on the farm. This includes burning containers on the farm.	Triple-rinsed containers or empty bags are disposed of on the farm.	Triple-rinsed containers are disposed of through an appropriate waste collection service.	Tripe-rinsed containers are returned to dealers. Bags are returned to supplier, or appropriate waste collection service is used.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Do you have an emergency spill containment plan should a pesticide spill or major leak occur?	No plan exists	A plan exists, but is not know by all employees		A plan exists and is know by all employees	
Are pesticides stored in your cellar or attached garage?	Yes			No	
Are pesticides stored with your livestock?	Yes			No	
Paper/cardboard pesticide container	Disposal of partially filled or empty container on farm. Container incinerated when not recommended by label instructions.	Burned in field where pesticides were used, if recommended by label instructions.	Empty containers taken to permitted transfer station or landfill for recycling or disposal after cleaning as directed on label instructions or safely stored for future recycling opportunity.	Returned to supplier or community hazardous material collection program. Followed label instructions.	
Plastic pesticide container	Disposals of partially filled or empty unrinsed container on farm or at dump. Disposal or reuse of triple-rinsed container on farm.	Unrinsed containers safely stored for future disposal at permitted transfer station or landfill. OR Burned in field where used, if recommended by label instructions.	Routinely dispose of unrinsed containers at permitted transfer station or landfill. OR Triple-rinsed containers safely stored for future disposal at permitted transfer station or landfill.	Triple rinsed container returned to retail store for reuse, or taken to local pesticide container recycling program or permitted transfer station or landfill. Rinsate applied to appropriate crop.	
Application					
What is the distance of applications from a well or spring?	Applications are made adjacent to or over a well or spring.		All geographic use restrictions and label precautions regarding groundwater are followed.	Applications are not made within the recharge area of a well or spring.	
Is the EPA Worker Protection Standard followed?	Owner does not know about the U.S. EPA Worker Protection Standard program	Owner is aware of the U.S. EPA Worker Protection Standard program and needs additional information to comply.		Owner is familiar with and fully complies with the U.S. EPA Worker Protection Standard program.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What pesticide use records are kept?	No records are kept. Chemicals used are known by memory and invoices only.		Pesticide use records include: ___ Pesticides used ___ Where applied ___ Date applied ___ Quantity applied ___ Rates applied ___ Method of application ___ Applicator's name ___ Target pests	Pesticide use records include: ___ Pesticides used ___ Where applied ___ Date applied ___ Quantity applied ___ Rates applied ___ Method of application ___ Applicator's name ___ Target pests ___ Weather conditions ___ Stage of crop development ___ Stage of pest development ___ apparent effectiveness	
Are soil and field conditions considered when pesticide products are selected?	Product is not selected considering soil leaching and runoff potential.			Product is selected considering soil leaching and runoff potential.	
Are IPM principles considered in your pest management program?	No IPM principals are considered.	Adequate and timely pest information is not available to make pest management decisions.		IPM components; such as crop and pest scouting, biological control, cultural practices or the use of resistant varieties; are considered to reduce or eliminate pesticide use.	
What is the level of training of the business owner and the pesticide applicators?	No one involved in application is certified AND pesticide labels are not always followed.	No one involved in application is certified, but labels are followed.	The owner is appropriately certified as a commercial or private applicator who is providing direct supervision to appropriately-trained or certified employees doing the application, AND pesticide labels are followed.	The applicator is appropriately certified as a commercial applicator AND pesticide labels are followed.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Are weather conditions considered before applying pesticides?	Pesticides are sprayed according to a pre-set schedule. Weather conditions are not considered.			Weather conditions are considered. Wind, storms, humidity, and temperature are at levels favorable for spraying.	
Is application equipment properly and regularly calibrated?	Regular calibration of equipment is not practiced.	Spray equipment is calibrated at the beginning of each season only.	Spray equipment is calibrated at the beginning of each season AND after changes of tractor wheels, nozzles or pressure gauges.	Spray equipment is calibrated at the beginning of each season AND after every 250 hours of spraying, AND after changes of tractor wheels, nozzles or pressure gauges.	
Is the applicator aware of and following label set-back requirements?	Applications are made adjacent to or on top of a water source or tile drain inlet.	Applications are made within 35 ft. of an open water source or tile drain inlet. OR The set-back zone requirement of the label is ignored.		Applications are kept at least 35 ft. from an open water source or tile drain inlet AND are in accordance with label direction; specifically, where set-back zones are required by the label.	
Is the pesticide product currently being used have a label containing a precautionary statement about use of that product on vulnerable soils?	No			Yes	

Fertilizer Management

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Storage					
What is the distance of the flow path from fertilizer storage to the nearest surface waterbody or water well? *(X is the minimum separation distance that is either recommended or required from a fertilizer flow path to a waterbody)*	Less than X feet	Between 1X and 2X	Between 2X and 3X	Greater than 3X OR No fertilizer stored on the farm.	 
What type of fertilizer storage facility is used for dry formulations?	Non-weatherproof storage on a permeable floor (i.e. – gravel or dirt).			Weatherproof storage on impermeable floor (i.e. – sealed concrete).	
What type of fertilizer storage facility is used for liquid formulations?	No secondary containment exists. Spills cannot be contained.		Secondary earthen containment exists. Most of spill can be recovered.	Impermeable secondary containment (i.e. – curbs or dikes present to contain leaks).	
Application					
What is the rate of fertilizer application?	Fertilizer rate is not based on soil tests. OR Other nutrient sources are unaccounted for. OR Proper pH is not maintained.			Fertilizer rate is recommended by an appropriate soil test lab. AND Soil tests are accounted for (i.e. –crop residues and manure). AND Proper soil pH is maintained.	
What is the timing of application?	Fertilizer is applied during the non-growing season.			Nutrients are applied as close to the period of maximum nutrient uptake as possible.	
When and how is fertilizer applied to row crops?	All fertilizer is applied before planting.			Some of the nitrogen (except for legumes) and most, if not all, of phosphorus is placed in a band-placed starter fertilizer.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
How is application equipment maintained?	Fertilizer application equipment is not maintained or calibrated.	All fertilizer application equipment, including planters, is well-maintained but not calibrated.	All fertilizer application equipment, including planters, is well-maintained, but is calibrated less than annually.	All fertilizer application equipment, including planters, is well-maintained and calibrated annually.	

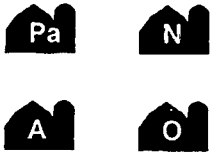
Fuel Storage

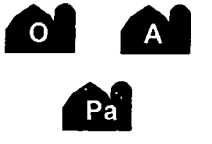
	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
How far is petroleum stored from surface water sources? *(X is the minimum separation distance that is either recommended or required from petroleum storage to surface water sources)*	Less than X feet.	Between 1X and 2X	Between 2x and 3X	Greater than 3X	
How far is the tank from a drinking water well?	Tank is at grade or upslope less than X feet from a well.	Tank is upslope more than X feet from a well.	Tank is downslope more than X feet from a well.	Tank is outside wellhead area.	
What type of material is the tank constructed from, and is there corrosion protection?	Bare steel tank older than 15 years old.	Painted steel tank older than 15 years old, or bare steel tank less than 15 years old.	Steel tank newer than 15 years coated with paint or asphalt	Synthetic tank or tank protected from rust by cathodic protection.	
What type of tank overfill protection exists?	No protection.	Impermeable overflow spill catchment basin installed around fill port.	Overfill alarm and impermeable overflow spill catchment basin installed around fill port.	Automatic shutoff and impermeable overflow spill catchment basin installed around fill port.	
How do you monitor for leaks?	No inventory, monitoring or testing.		Daily inventory control. AND Tank tightness testing every 15 years.	In-tank leak monitoring system. AND Tank tightness testing every 5 years.	
Above-Ground Storage Tanks					
What type of secondary containment do you have?	No secondary containment.	Tank is placed on pad.	Tank is placed within dike and on a pad made of low-permeability soils. Dike is able to hold 110% of tank capacity.	Single-walled tank placed within concrete or synthetic dike with pad able to hold 110% of tank capacity AND Roof over tank and pad to exclude rainwater and snow. OR Double-walled tank at least 10 gauge steel with outer jacket covering at least bottom 80% of tank.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Underground Storage Tanks					
What is the soil type and the depth of the water table.	Fine-textured soils (clay loam and silty clay). OR Soils are often saturated.	Medium-textured soils (silt loams and loams). AND Seasonally-high water table.	Moderately well-drained soils. AND Water table rarely high.	Well-drained soils. AND Water table is below tank.	
If there is an unused underground tank, what has been done to prevent possible future leaks?	Tank was left untouched in the ground.	Tank was removed or filled with inert material. Excavation was not checked for contamination.	Tank completely emptied, rendered free of petroleum vapors, and filled with inert material.	Tank taken from ground and excavation was checked for evidence of contamination.	
Do you have a written emergency spill response plan that shows action to be taken in case of spill, leak , fire, or explosion?	No plan exists	A plan exists, but is not know by all employees		A plan exists and is know by all employees	
Is cleanup equipment available at the site?	No			Yes	H
If tank is located in a floodplain, is the tank anchored to avoid flotation or lateral movement?	No			Yes	
Are fill ports painted with the proper paint code: Red – gasoline Yellow – diesel Brown – kerosene	No			Yes	
Is all piping and connections made to tanks at the top centerline of the tank to prevent leaks?	No			Yes	
Are records kept of dates and types of inspections performed, as well as leaks detected?	No			Yes	

Medical Disposables

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
How are needles or other sharp implements used to treat animals handled on your farm?	No control of used needles or sharp implements	Needles or sharp implements are placed in a sealed plastic bottle marked "SHARPS".		Pick up by Veterinarian OR other approved medical disposables method is used.	
How is old medicine handled on your farm?	No control of old medicine.			Old medicine is placed in trash for pickup by Veterinarian OR other approved medical disposables method is used.	Pa

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Rendering Service					
How soon is request for pick-up made after death?	Rendering company not called within 24 hours of death			Request for pick up is made within 24 hours of death	
Where are dead animals stored before they are disposed of?	Dead animals left in open OR Dead animals stored near wells or surface water.			Dead animals are stored in secured structure until pick up.	
Burial					
Burial site	Dead animals buried in flood plains or wetlands OR Dead animals buried within 100 feet of a private water well or surface water.			Dead animals buried outside of flood plains and wetlands AND Dead animals are buried greater than 100 feet from a private water well and not within 4 feet of groundwater AND Dead animals are not buried within 100 feet of surface water.	
Burial process	Dead animals not are not immediately covered with six inches of soil OR Permanent coverage of dead animals with soil is not at least 30 inches deep OR Water from groundwater table enters burial pit.			Dead animals immediately covered with six inches of soil AND Dead animals eventually covered with 30 inches of soil AND Groundwater table does not enter the burial pit.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Composting Practices					
Composting site	Site located in a 100 year flood plain OR Site is less than 100 feet from private water wells OR Site is less than 100 feet from surface water.			Composting site located outside of 100-year flood plain AND Site is greater than 100 feet from private water wells and surface water.	
Composting process	Dead animals are not sufficiently covered with organic material AND Composting not conducted in a manner that prevents runoff or leachate.			Dead animals are completely covered with organic material AND Composting done in a manner that prevents runoff or leachate.	
Incineration Practices					
Incineration practices	Dead animals not incinerated within 24 hours of death OR Dead animals disposed of in unapproved incinerator, or without use of incinerator, such as open burning.			All dead animals are incinerated in an approved incinerator within 24 hours of death.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
What is done with...	Dumped or burned on farm.			Re-used where possible. OR Taken to a recycling depot. OR Disposed of at a licensed landfill site.	
- Old farm tires?	____			____	
- Plastics?	____			____	
- Other material? _____	____			____	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Vehicle/Metal Equipment Maintenance Products					
Used antifreeze	Disposal on farm or at dump.	Taken to permitted transfer station or landfill.	Collected and disposed of at municipal sewage treatment plant with permission of municipality.	Saved and taken to antifreeze recycling facility, or distilled and mixed with fresh antifreeze for use in other radiators.	
Waste oil and grease	Disposal on farm or at dump.	Collected and disposed of at permitted transfer station or landfill.	Reused for lubrication. Burned for heat in an approved waste-oil fired space heater or stored for future collection opportunity.	Routinely taken to used oil collection tank for energy recovery or recycling.	
Waste oil sludge (leftover after burning in oil-fired space heater)	Disposal on farm or at dump.	Collected and disposed of at permitted transfer station or landfill approved for special wastes.	Safely stored for future collection opportunity.	Routinely taken to community hazardous material collection program.	
Spent organic solvent/parts cleaner	Disposal of solvents or sludge on farm or at dump.	Evaporated in open air. Sludge taken to permitted transfer station or landfill approved for special wastes.	Process filtered or distilled in ventilated area and reused. Sludge taken to permitted transfer station or landfill approved by NDEQ for special wastes.	Solvent recylcing collection service routinely used for leftover cleaners.	
Rust removal products	Disposal of used or leftover product on farm or at dump.	Disposal at permitted transfer station or landfill.	Safely stored for future collection opportunity.	Used up or shared with someone else. Routinely taken to community hazardous material collection program.	
Lead acid battery	Disposal on farm or at dump.	Used batteries taken to permitted transfer station or landfill.	Batteries safely stored away from well.	Batteries routinely taken to recycling center or battery store.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Vehicle maintenance drips and spills	Flushing onto farm property.	Contained on paved area with sawdust or oil dry material. Contaminated sawdust disposed of on farm or at dump.	Contained on paved area with sawdust or oil dry material. Contaminated sawdust spread on fields.	Contained on paved area with sawdust or oil dry material. Contaminated sawdust disposed of at licensed transfer station or landfill. Larger quantities maybe considered "regulated quantities:.	
Container for oil or other vehicle product (antifreeze, brake fluid, etc.)	Disposal of partially filled or empty container on farm or at dump. Reuse of triple rinsed container on farm.	Any remaining ingredients evaporated in safe conditions. Empty container taken to permitted transfer station or landfill approved for special wastes OR burned if recommended by label instructions.	Any remaining ingredients evaporated in safe conditions. Container recycled or stored for future recycling.	Product used up and container recycled or stored for future recycling.	
Unlabeled Products					
Hazardous household product containers	Disposal of partially filled or empty container on farm or at dump.	Disposal of partially filled or empty container at permitted transfer station or landfill.	Empty container taken to recycling facility or stored for future recycling opportunity.	Empty or partially filled container taken to community hazardous material collection program.	
Old barrels and containers – unlabeled and contents unknown	Disposal of partially filled or empty container on farm or at dump.	Disposal of partially filled or empty container at permitted transfer station or landfill.	Identify contents of partially filled containers and take to community hazardous material collection program.	Identify previous contents of empty container. Properly dispose of empty container.	
Building/Wood Maintenance Products					
Adhesives, such as caulk and solvent-based glues	Disposal on farm or at dump.	Liquid safely evaporated in open air. Sludge or leftover product taken to transfer station or landfill.	Safely stored in preparation for community hazardous materials collection program.	Used up or shared with someone else. Leftover adhesives taken to community hazardous material collection program.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Paint brush or spray gun cleaners (solvent based)	Disposal of leftover or used cleaning solvents on farm or at dump.	Cleaned in contained, ventilated area. Filtered cleaning solvents reused or safely evaporated in open air. Sludge taken to permitted transfer station or landfill approved for special wastes	Cleaned in contained ventilation area. Filtered cleaning solvents reused or safely evaporated in open air. Sledge safely stored for future collection program.	Cleaned in contained, ventilated area. Leftover or used solvent taken to community hazardous material collection program or solvent recycling collection service used for leftover cleaners.	
Do you recycle paints and solvents?	No			Yes	
Lead-based paint (use for leaded pigment in paint was banned in 1973)	Disposal of sludge or paint on farm or at dump.	Liquid evaporated in open air. Paint or sludge taken to permitted transfer station or landfill.	Liquid evaporated in open air. Safely stored for future collection program.	Leftover paint taken to community hazardous material collection program.	H
Paint or stain (no lead)	Disposal of oil-based paints, latex paints, or stains on farm or at dump.	Liquid evaporated in open air. Solidified paint or sludge taken to permitted transfer station or landfill.	Liquid evaporated in open air. Safely stored for future hazardous materials collection program.	Used up or shared with someone else. Leftover paint or stain taken to community pain swap or hazardous material collection program.	
Stripper or thinner for pain/finish	Disposal of sludge, stripper, or thinner on farm or at dump.	Liquid evaporated in open air. Stripper or stripper sludge taken to permitted transfer station or landfill.	Liquid evaporated in open air. Safely stored for future hazardous materials collection program.	Spills contained. Unused products used up. Community hazardous material collection program used for leftover stripper or thinner.	
Surface cleaners (solvent-based deck wash, fence wash, etc.)	Disposal of sludge or cleaners on farm or at dump.	Liquid cleaners evaporated in open air. Solidified cleaners or sludge taken to permitted transfer station or landfill.	Liquid cleaners evaporated in open air. Safely stored for future hazardous materials collection program.	Used up or shared with someone else. Community hazardous material collection program used for leftover cleaners.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Wood Preserving (creosote, chromated copper Arsenate (CCS), osmose K-33, pentachlorophenol, or methyl isothiocyanate)					
Application drips and spills *(X is the minimum separation distance that is either recommended or required from application sites to well)*	Application without containment within X feet of well. Applicator and drop cloths disposed of on farm or at dump.	Application without containment more than X feet from well. Applicator and drop cloths disposed of on farm or at dump.	Application with containment within X feet of well. Drips and spills contained. Applicator and drop cloths disposed of at permitted transfer station or landfill.	Application with containment more than X feet of well. Drips and spills contained. Applicator and drop cloths disposed of at permitted transfer station or landfill.	
Disposal of unused preservatives	Disposal on farm or at dump.	Disposal at permitted transfer station or landfill.		Used up or shared with someone else if not a banned product. Community hazardous material collection program used for leftover preservatives.	
Ash Disposal					
From farm burn barrel or incinerator	Disposal of ash from mixed trash on farm or at dump	Disposal of ash from dry combustibles only, on farm or spread on fields.	Store ash from disposal at permitted landfill or transfer station at a later time.	Ash collected and routinely disposed of at permitted transfer station or landfill.	

Nuisance Issues Control

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Which of the following dust control precautions do you have in place for your unpaved roadways? - Limiting vehicle speed - Watering - Use of chemical stabilizer - Gravelling	No _____ _____ _____ _____			Yes _____ _____ _____ _____	A SS O
How does your facility deal with fly control?	No precautions are in place.	Spraying of insecticides OR Sticky tapes, bait traps, or bug zappers OR Biological control by using the natural enemies of flies such as beetles, mites, and parasitoids.		Animal pens, feeding areas, return alleys silo leaching areas, and other spots where manure or grain may build up undisturbed are cleaned out once a week, making and effort to get all material in the corners and protected spots.	A $
Are neighbors notified prior to the application of pesticides or fertilizers?	No			Yes	
Do you burn waste on your site?	Mixtures of waste (including paper, solvents, batteries, and plastics) are burned, releasing metals, acids, and chlorine compounds.	Only non-toxic materials are burned. If burning is legal, burning guidelines are strictly followed.		No household waste is burned on-site.	O A
Are pesticide drift and odor considered during application?	No			Yes	A O $

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing all worksheets, identify the over-all strengths and weaknesses of your system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Activities	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Term Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	
Long Term Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

Activities	Years in Which Significant Progress is Made Towards Goal?	Year in Which Goal is Accomplished?
Short Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		
Long Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		

Review of Options:

For additional information please see the following publications which are available at Natural Resource, Agriculture, and Engineering Service (NRAES) web site (www.nraes.org) and at the MidWest Planning Service (MWPS) web site (www.mwpshq.org).

Agrichemical Handling

- National Symposium on Pesticide and Fertilizer Containment: Design and Management. MidWest Plan Service. 160 pages $15.00
- Pesticide and Fertilizer Containment Symposium, 2. MidWest Plan Service. 243 pages $20.00
- On-Farm Agrichemical Handling Facilities. NRAES, 1995. 22 pages $7.00
- Designing Facilities for Pesticide and Fertilizer Containment. MidWest Plan Service, 1991. 113 pages $15.00
- National Symposium on Pesticide and Fertilizer Containment: Design and Management. MidWest Plan Service, 1992. 160 pages $15.00
- Pesticide and Fertilizer Containment Symposium, 2. MidWest Plan Service, 1994. 243 pages $20.00

Home

- Home*A*Syst: An Environmental Risk-Assessment Guide for the Home. NRAES, 1997. 122 pages $8.00
- Home Water Treatment. NRAES, 1995. 120 pages $15.00
- Private Drinking Water Supplies: Quality, Testing and Options for Problem Waters. NRAES, 1991. 60 pages $8.00
- Private Water Systems Handbook.. MidWest Plan Service, 1979. 72 pages $7.00

Petroleum

Manure Storage Environmental Assessment Module

Table of Contents

Introduction

Objective

The goal of this assessment package is to help a livestock or poultry producer confidentially evaluate environmental issues that relate to manure storage. This package will assist with:

- Assessing your operation's compliance with commonly regulated issues
- Highlight the strengths and weaknesses of your operation as they relate to manure storage
- Promote management practices that minimize the impact of manure storage on water and air quality
- Evaluating air quality, neighbor relations and nuisance issues

Environmental Benefits

Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

N	Reduce Nitrogen excretion	SS	Reduced Suspended Solids risk
P	Reduced Phosphorus excretion	NH_3	Reduced Ammonia emission
Pa	Reduced Pathogen risk	O	Reduced Odor risk
A	Improved Farm Aesthetics	$	Financial Benefits

Why Should I Be Concerned?

The manure storage facilities of a livestock operation are frequently sources of public concern about water and air quality. They are also a major focus of regulatory agencies. Manure storage that is properly designed, constructed, managed and maintained is less likely to become a source of water or air pollution.

Manure storage is an important part of modern livestock operations. Animal performance and health require that manure be frequently removed from the housing area. However, land application of manure is impractical or illegal at certain times of the year. Many states ban the application of manure to frozen or saturated soil. Often when crops are being grown there is no land available for manure spreading. The design and capacity of manure storage must be adequate to contain the manure produced until land application is possible.

Some of the potential water contaminants associated with animal manure are phosphorus, nitrogen and pathogens. Erosion of soil by surface runoff or the accidental release of manure to water bodies is the general mode of phosphorus transport. In surface water, high levels of phosphorus can result in excess plant and algae growth. Algae blooms are a nuisance to recreational users of a water body. Algae can also release toxins that are lethal to livestock or other animals which drink the water. Dissolved oxygen in the water is depleted as algae respire at night, or die and decompose, and can result in fish kills. Phosphorus does not generally move downward through the soil profile because it adsorbs tightly to soil particles. Soils saturated with Phosphorus or soils with preferential flow paths can leach Phosphorus into lower soil layers.

The nitrogen found in stored manure is all in ammonium or organic form. Such forms can travel with surface water runoff. They are less likely to leach through soils to groundwater. Depending on the cation exchange capacity of individual soils, ammonium is likely to move a few inches to a few feet per year.

Pathogens like Giardia, Cryptosporidium, Escherichia coli O157:H7, Campyloboeter, and Salmonella can be found in animal manure. All have the potential to cause human illnesses if allowed to contaminate water used for drinking or recreation.

Storing manure allows the material to partially decompose anaerobically. Some of the byproducts of this process have a very unpleasant aroma even in small concentrations. Often the use of manure storage to reduce the potential for water pollution results in a decline in air quality when the storage is agitated and spread. This can cause conflicts with neighbors.

How Do I Proceed?

You will need approximately X amount of time to complete the entire Manure Storage Assessment Module. Some documents that might be useful include:

- Maps of your farm and surrounding areas
- A county soil survey (if soil types are not identified on your maps)
- Completed permit applications and other related documents
- A summary of local livestock-related zoning regulations

Step 1: Am I in compliance with manure storage regulations?
Complete the Regulatory Compliance Review worksheets (pages X-X). If you answer "Yes" to all questions, proceed to Step 2. If you answer "No" to one or more questions, make note of the how many on the appropriate line on page X. Proceed to Step 2.

Step 2: Are there any environmental risk factors associated with my manure storage site?
Complete the Site Assessment using provided map grids (page X) or with your own quadrangle maps. Also complete the site assessment worksheets (pages X-X). Any high or moderate-high risk situations should be documented as "weaknesses of the system" on page X. Also be sure to note if your site has any particularly favorable characteristics as "strengths of the system" on page X. Proceed to Step 3.

Step 3: Is my system designed and managed in an environmentally responsible manner?
This section does not assess compliance with regulations. It is meant to assess environmental stewardship practices based on the most current scientific knowledge. Complete the Systems and Management Review worksheets (pages X-X). Any high or moderate-high risk situations should be documented as "weaknesses of the system" on page X. Also be sure to note any of your systems or management strengths on page X. Proceed to Step 4.

Step 4: What are the strengths, weaknesses and priorities of my operation as it relates to manure storage?
The worksheets on page X help identify strengths and weaknesses of your system, and also planned changes or goals for any high-risk issues. Strengths of the system might include: areas where your operation exceeds regulatory standards, a section where you identified mostly low-risk situations, or other especially environmentally sound practices. Weaknesses of the system might include: non-compliance with regulations, high or moderate-high risk situations as identified on the worksheets, other areas you feel need to be improved to meet your personal, environmental, financial, or other goals.

The worksheets on page X help measure progress toward improvement or progress toward environmental goals over several years. Capital or labor may limit the amount of change an operation may make at any one time. Continued review and documentation of progress can be a valuable tool for the producer as he/she reviews their own goals or possibly as they work with regulatory agencies.

Step 5: What options are available to help me manage my manure storage facility?
Using reference materials and other resources you may find solutions to move your identified weaknesses to strengths.

Regulatory Compliance Review: Manure Storage

Instructions to State Pilot Team: *This is meant to be a template for you to modify to address state specific regulations before it is used by producers. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response.*

Note to local advisors and consultants: If local regulations that apply to a particular livestock operation exceed the limits of the state regulations, please edit the center column to reflect the local regulations. If additional issues not listed are regulated, fill them in the rows provided marked "other:" or insert additional rows at an appropriate place in the table.

For each issue listed, read across to the right and determine if your manure storage facilities are in compliance with these rules. If a question does not apply to your operation, checkmark "Not applicable". If an advisor or consultant has not already summarized local regulations for you, please be aware that additional or more restrictive local regulations may apply to your livestock operation.

Regulatory Compliance Review: Worksheet 1: Permit Requirements

Issue	Summary of Regulations	Is my operation in compliance?
Does the operation need a permit to construct a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Does the operation need a NPDES or other federal/state/county permit to operate a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do rules change with animal numbers or animal units?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is public notice/comment required before construction?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are engineering design and construction plans required for a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there requirements pertaining to closure of a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there financial assurance requirements relative to operation or closure of a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there restrictions on the type of manure storage construction (e.g. earthen structures, covered facility) or type of storage system (e.g. anaerobic lagoon) allowed?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Issue	Summary of Regulations	Is my operation in compliance?
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Regulatory Compliance Review: Worksheet 2: Sizing Considerations

For each issue listed, read across to the right and determine if your manure storage facilities are in compliance with these rules. If a question does not apply to your operation, checkmark "Not applicable". If an advisor or consultant has not already summarized local regulations for you, please be aware that additional or more restrictive local regulations may apply to your livestock operation.

Issue	Summary of Regulations	Is my operation in compliance?
Is the sizing of a manure storage facility required to include a:		
Specific storage period or size?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Specific allowance for depth above maximum level for start pumping?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Sludge volume component?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Permanent volume to maintain a wetted seal?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Allowance for open lot runoff control?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Required loading rate for a permanent treatment volume (anaerobic lagoon only)?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Volume for a specific storm event (e.g. 25-yr, 24-hr storm)?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Volume for chronic wet years (e.g. wettest year in 10 years)?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Regulatory Compliance Review: Worksheet 3: Siting Issues/Soil & Geology

For each issue listed, read across to the right and determine if your manure storage facilities are in compliance with these rules. If a question does not apply to your operation, checkmark "Not applicable". If an advisor or consultant has not already summarized local regulations for you, please be aware that additional or more restrictive local regulations may apply to your livestock operation.

Issue	Summary of Regulations			Is my operation in compliance?
Are regulatory buffer distances required for a manure storage facility?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there any required setbacks or separation distances from any of the following:				___ Yes ___ No ___ Not applicable ___ Don't Know
Property Lines?	___ Yes	___ No	If Yes, summarize:	
Residences?	___ Yes	___ No	If Yes, summarize:	
Surface water?	___ Yes	___ No	If Yes, summarize:	
Public facilities?	___ Yes	___ No	If Yes, summarize:	
Highways?	___ Yes	___ No	If Yes, summarize:	
Wells?	___ Yes	___ No	If Yes, summarize:	
Sinkholes?	___ Yes	___ No	If Yes, summarize:	
_____?	___ Yes	___ No	If Yes, summarize:	
_____?	___ Yes	___ No	If Yes, summarize:	
Are there required flood plain or water table considerations in siting a manure storage facility?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulated site conditions specific to construction of an earthen manure impoundment?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other:	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Soil and Geology Considerations				
Is a soil evaluation required to construct a manure storage facility?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is there a required separation from bedrock or groundwater?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a geologic evaluation below the storage structure required for a manure storage site?	___ Yes	___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Issue	Summary of Regulations	Is my operation in compliance?
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Regulatory Compliance Review: Worksheet 4: Design/Construction Documents, Storage Features, Temporary Manure Storage

For each issue listed, read across to the right and determine if your manure storage facilities are in compliance with these rules. If a question does not apply to your operation, checkmark "Not applicable". If an advisor or consultant has not already summarized local regulations for you, please be aware that additional or more restrictive local regulations may apply to your livestock operation.

Issue	Summary of Regulations	Is my operation in compliance?
Design/Construction Documents Required		
Are engineering design and construction plans required for a manure storage facility?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are engineering plans required to be prepared and stamped by a registered professional engineer?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is a Construction Quality Assurance Plan required of the contractor and/or designer?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Storage Features		
Are there safety requirements such as signage or fencing for manure storage facilities ?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there secondary containment requirements for unplanned discharges?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Temporary Manure Storage Pile/Composting Manure Issues		
Are there rules that govern the location of temporary manure storage piles or manure composting sites?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there rules that govern the time of year, or for how long temporary manure storage piles are allowed?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there rules that pertain to containment or runoff from temporary manure storage piles or manure composting sites?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Other:	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Regulatory Compliance Review: Worksheet 5: Liner Considerations

For each issue listed, read across to the right and determine if your manure storage facilities are in compliance with these rules. If a question does not apply to your operation, checkmark "Not applicable". If an advisor or consultant has not already summarized local regulations for you, please be aware that additional or more restrictive local regulations may apply to your livestock operation.

Issue	Summary of Regulations	Is my operation in compliance?
Are there specific requirements for liner construction?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there permeability or seepage limits?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there pre-construction requirements for permeability testing of soils to be used in construction of a liner?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there post-construction requirements for permeability or seepage testing of completed liner?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
For an existing non-permitted facility, are there requirements for documenting permeability or seepage rate?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Liner performance must commonly be documented prior to operating an animal manure storage facility. The table below lists multiple tests used for evaluating a liner. Identify those tests that are required by your state or local regulations and the limits that have been set for that test procedure.

Test or Analysis	Description	Required by my state:	Regulatory Limit
Liquid limits (LL)	Minimum moisture content of soil/water mixture at which mixture behaves like a liquid (can be stirred).	Pre-construction? ___ Yes ___ No Post-construction? ___ Yes ___ No	
Plasticity limits (PL)	Minimum moisture content of soil/water mixture at which mixture behaves like a plastic solid (can be rolled into a ball or thread).	Pre-construction? ___ Yes ___ No Post-construction? ___ Yes ___ No	
Plasticity Index (PI)	Liquid limit minus plastic limit. Indicates range of moisture contents that soil behaves as a plastic solid. A larger number is more ideal for constructing a liner.	Pre-construction? ___ Yes ___ No Post-construction? ___ Yes ___ No	
Standard proctor density	Maximum density of soil when compacted at optimum moisture. Soils compacted to 90% - 95% of Proctor density are least permeable.	Pre-construction? ___ Yes ___ No Post-construction? ___ Yes ___ No	
Coefficient of permeability	Characteristic of the soil that defines its resistance to the movement of liquid.	Pre-construction? ___ Yes ___ No Post-construction? ___ Yes ___ No	

Site Assessment:

A mapping exercise is found in the "Farmstead Facilities: Manure and Related Effluents" module. Refer to that exercise to identify air and water quality concerns that may be related to your manure storage facilities.

Site Review:
Assessment of Siting Risk Factors

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (RISK 1)	Environmental Benefits
Location of manure storage relative to:					
Nearest surface water source?	Less than 100 feet	100 to 199 feet	200 to 500 feet	Greater than 500 feet	
Flood plain?	Storage in located in flood plain.			Storage is located outside of flood plain or above high ground water table.	
Drinking water well?	Well is within 100 feet.	Well is 100 to 250 feet AND Down slope or at grade.	Well is more than 250 feet AND Down-slope or at grade.	Well is more than 100 feet AND Up-slope	
Homes, public use areas, or businesses? Distance:	300 a.u. and less ...< ¼ mile More than 300 a.u. ...< ½ mile	300 a.u. and less ...¼ to ½ mile More than 300 a.u. ...½ to 1 mile	300 a.u. and less ...½ to 1 mile More than 300 a.u. ...1 to 2 mile	300 a.u. and less ...>1 mile More than 300 a.u. ...>2 mile	
Direction: Neighbors are...	located downwind for prevailing spring, summer or fall winds		located downwind for prevailing winter winds only	not located downwind for prevailing winds at any time of year	
Elevation: Neighbors are located at...	lower elevation than storage and in valley.	lower elevation than storage but in open area.	similar elevation than storage and in open area	higher elevation than storage Sizeable hill, shelterbelt or o	
Drainage around manure storage	Poor drainage and access roads make manure removal possible only under dry conditions			Excellent drainage and access roads make manure removal possible in a variety of weather conditions.	
Visibility?	Storage facility is highly visible due to location close to road.	Storage is recessed from neighbors and road but visible.	Only neighboring residents are aware of storage due to partial screening	Topography, vegetation or use of under-barn storage visually screens storage facility.	

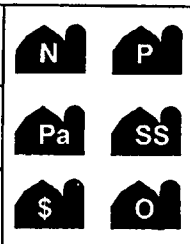
	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (RISK 1)	Environmental Benefits
Storage facilities?	No room for future expansion of storage facilities exists			Room for future expansion of storage facilities exists	
Crop land base in vicinity of storage? (see Land Application Module)	Insufficient cropland is available to which manure can be transported.		Sufficient cropland is available for managing manure nitrogen to which manure can be transported.	Sufficient cropland is available for managing manure phosphorus to which manure can be transported.	$
Soil and geology considerations about slurry or liquid manure storage					
Information available about geology below site?	No soil survey, well log or soil boring information is available.	USDA county soil survey information is used to evaluate site	Soil borings detailing soil characteristics to at least 4 feet below the storage are available from a nearby site of similar geology.	Soil borings detailing soil characteristics to at least 4 feet below the storage are available from site on which storage is located	
Characteristics of soils used in construction of an earthen liner (soil groupings information available on page X)?	Group 1 Passing # 200 Sieve - < 20% Plasticity Index - <5	Group 2 Passing # 200 Sieve - <20% Plasticity Index - >15 OR Passing # 200 Sieve - >20% Plasticity Index - <5	Group 3 Passing # 200 Sieve - >20% Plasticity Index – 16 - 30	Group 4 Passing # 200 Sieve - >20% Plasticity Index - >30	N
Characteristics of soil, sediment, or bedrock below storage site?	Clean gravel (GP), or clean sands (GW, SW, SP,) or cavernous or karst limestone or similar topography, permeable basalts (OL, OH).	Fine sand, silty sand and gravel mixes (, SM, GM, GW-GM, GP-GM, SW-SM, SP-SM) or Limestone, dolomites, clean sandstone, and fractured igneous and metaphoric rocks.	Silt, clay, and sand-silt-clay mixes, organic mixes, organic silts, and organic clays (, GC, , SC, MH,ML, ML-CL, GW-GC, , GC-GM, SW-SC, SP-SC, SC-SM) or interbedded sandstone, siltstone, and shales	Clay (CL or CH) or unfractured bedrock	Pa
Distance to high risk geology (If high risk geology noted in previous question)?	High-risk geology is less than 4 feet below storage bottom or depth is unknown.		High risk geology is more than 4 feet below storage bottom	Impermeable layer of clay or unfractured bedrock exists between storage and high-risk geology.	
Evidence of seepage into test holes or during construction?	Evidence of seepage observed			No evidence of seepage observed	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Soil and geology considerations about dry manure storage					
Manure stacked in field (temporary storage on soil base)?	Stacked for more than 30 days OR Stacked on coarse-textured soils. Fractured bedrock or water table shallower than 20 feet OR Upslope surface water not diverted.	Stacked < 30 days; Medium- or fine- textured soils. Water table is deeper than 20 feet AND Upslope surface water diverted around pile.	Stacked < 30 days; Medium- or fine- textured soils; Water table is deeper than 20 feet; Up-slope surface water diverted around pile; AND New location for pile each year.	Never stacked on field or bare soil	
Stacked in outdoor feedyard or permanent site for dry manure storage?	Earthen surface with coarse-textured soils. Fractured bedrock or water table shallower than 20 feet.	Earthen surface with medium or fine textured soils. Water table deeper than 20 feet.	Earthen surface with medium or fine textured soils. Water table deeper than 20 feet.	Well-maintained concrete surface.	
Stored in roofed animal housing on...	Earthen floor of coarse-textured soils and subject to surface water runoff. Water table or fractured bedrock shallower than 20 feet.	Concrete floor or compacted earthen floor of medium- or fine-textured soils[1] and subject to surface water runoff. Water table or fractured bedrock shallower than 20 feet.	Concrete floor or compacted earthen floor of medium- or fine-textured soils and protected from surface water runoff. Water table or fractured bedrock deeper than20 feet.	Building has concrete floor, protected from surface water runoff.	

Insert soil groupings information table here.

Systems & Management Review:
Worksheet 1: Environmental Planning

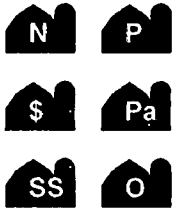
For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
1. Is a written management plan maintained for:					
Storage operation and maintenance?	No	Yes, but not accessible to all key employees		Yes, and accessible to all key employees	
Storage inspection?	No	Yes, but not accessible to all key employees		Yes, and accessible to all key employees	
Emergency response plan?	No	Yes, but not accessible to all key employees		Yes, and accessible to all key employees	
2. Are records maintained for:					
Timing of storage pumping and storage liquid levels?	No	Yes, partial records are available		All pumping events and monthly liquid levels are recorded	
Facility and equipment maintenance?	No	Yes, partial records are available		Yes, all maintenance is recorded	
Regular facility inspections?	No	Yes, partial records are available		Yes	

Systems and Management Review:
Worksheet 2: Sizing Considerations

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Manure storage structures can serve different purposes. Some structures are designed for storage only and are usually emptied completely when the manure is removed for land application. Other structures, such as anaerobic lagoons, are designed to store and treat the manure. A permanent pool is retained to facilitate bacterial growth needed to treat the waste. The size of these structures must be adequate for storage plus the treatment pool volume.

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Existing storage					
Is sufficient storage volume available until suitable land, climatic conditions or labor/equipment availability allows application?	Manure is often spread at an undesirable time of year (frozen or snow covered soil conditions) or at undesirable rates on any available land due to a full storage	Manure is occasionally spread at an undesirable time of year (frozen or snow covered soil conditions) or at undesirable rates on any available land due to a full storage		Sufficient volume exists to allow spreading of manure based upon a plan for nutrient utilization and minimizing nutrient runoff.	
New storage					
Sizing procedure includes:					
a. Sufficient volume for manure, urine, bedding, and process water	Less than three months	Three to six months	Six to eleven months	At least one year	
b. Allowance for permanent pool *(anaerobic lagoon only)?*	Designed below ASAE, NRCS, or state standards for anaerobic lagoon permanent pool volume.		Designed according to ASAE, NRCS, or state standards for anaerobic lagoon permanent pool volume.	Designed at double ASAE or NRCS standards for anaerobic lagoon permanent pool volume to reduce odor.	
c. Allowance for depth above maximum level for start pumping *(spillway included)*	No allowance	<1 foot	1 foot	At least 1 foot.	
d. Allowance for depth above maximum level for start pumping *(no spillway)*	No allowance	1 foot (uncovered storage)		At least 1 foot + rainfall from 25-year, 24-hour storm (uncovered storage) OR At least 1 foot (covered storage)	

e. Allowance for sludge *(anaerobic lagoon)* or solids accumulation *(below barn pits and storage basin).*	No			Yes	O
f. Allowance for storage of runoff from open lots, roof water, or other contributing drainage area.	No allowance	Allowance for runoff from less than a 25 year – 24 hour storm	Allowance for runoff from a 25 year – 24 hour storm OR Extended chronic wet period (wettest year in 10 years)	No contributing drainage area, Allowance for runoff from a 25 year – 24 hour storm AND Chronic wet period (wettest year in 10)	N P $ Pa SS O
Manure Storage Level Indicators					
Manure level is indicated by: a. Start Pumping marker?	No	Yes		Yes, measure is clearly visible.	N P
b. Stop Pumping marker *(for permanent pool in lagoon and wet seal maintenance in earthen basin)*?	No	Yes		Yes, measure is clearly visible.	$ Pa
c. Depth or "% of Full" marker?	No	Yes		Yes, measure is clearly visible.	SS O

Systems & Management Review:
Worksheet 3: Design

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Storage liner (soil, membrane, or concrete) considerations					
Liner was designed by: AND Installed by:	No one was involved in liner design. Contractor inexperienced in liner construction	By the construction contractor		By a professional engineer, engineer with NRCS or other appropriate agency, or other state registered designer. By a contractor experienced in liner construction.	N
The soil liner is protected from erosion resulting from: 1) manure inlets 2) waves 3) agitation equipment, and 4) rainfall.	Protection for more than one cause of erosion was not considered.	All but one statement is true		All statements are true.	Pa
Liner testing to substantiate liner's compliance with design standards included...	No testing of liner seepage was completed.	Post construction seepage testing or construction monitoring testing was completed for bottom of storage only.	Construction monitoring of liner moisture and density was completed for both liner sidewalls and bottom OR design engineer regularly inspected liner construction to insure acceptable liner construction.	Post construction seepage testing of representative storage bottom and sidewall by a commercial laboratory or engineering service.	

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Permeability rate or seepage rate used to design liner *(earthen lined storage structures only)?*	No evaluation of permeability rate or seepage rate was made during liner design, OR Permeability rate ≥ 10^{-6} cm/sec. (seepage rate ≥ 0.2 inches / day for 10' deep storage with 2' thick liner)		Permeability between 10^{-6} cm / sec. and 10^{-7} cm / sec (seepage rate between 0.2 and 0.02 inches/day for 10' deep storage with 2' thick liner) AND Permeability less than state standard.	Permeability ▸ 10^{-7} cm / sec.(seepage rate ▸ 0.02 inches / day for 10' deep storage with 2' thick liner) AND Permeability less than state standard	N
Liner designed with bentonite or soil dispersant additives?	No evaluation of permeability rate or seepage rate was made during liner design, OR Permeability tested with soil amendment ≥ 10^{-6} cm/sec.		Permeability tested with soil amendment is between 10^{-6} cm / sec. and 10^{-7} cm / sec AND Permeability less than state standard.	Permeability tested with soil amendment ▸ 10^{-7} cm / sec AND Permeability less than state standard	Pa
Storage structure features					
Sufficient access for complete removal of liquid and settled solids *(formed manure storage and earthen storage basins only)?*	Existing facility: Solids are accumulating with time. OR New facility: Agitation equipment is not readily available or access locations are not provided for agitation.	Only limited access for agitation equipment is provided.		Existing facility: Solids are not accumulating with time. OR New facility: Access for agitation equipment is provided at least every 50 feet of storage perimeter.	N P Pa
Manure inlets are located....	Above the liquid level.		Generally below the liquid level	Located below lowest liquid level	SS
Outlet pipes that pass through the wall or berm and...	Have one shutoff valve with no ability to lock valve closed	Have two shutoff valves but no ability to lock one valve closed	Have two shutoff valves with ability to lock one valve closed.	No outlet pipes exit through berm or wall below the storage's maximum liquid level.	O
Pit ventilation fans *(below barn storages)?*	No pit ventilation fans installed.	Pit ventilation fan WITHOUT appropriately designed inlet plenum.		Pit ventilation fan WITH appropriately designed inlet plenum.	O
Management of liquids from dry manure storage?	No control of runoff from solid manure storage located in vicinity of well, stream, major drainage, or other surface waters.	Runoff is directed towards crop land.	Runoff is directed to designed grass filter strip or constructed wetlands from which some runoff might escape.	Dry manure storage is roofed Runoff is directed to holding pond, constructed wetland, or grass filter strip from which runoff is very unlikely.	N P Pa SS

	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefits
Fencing and appropriate signage for limiting storage access *(outdoor storages)?*	No	Warning signs only		Yes	
An egress ladder for an individual falling into storage?	No		Yes, one ladder	Yes, one on all four sides	
Warning signs of dangers of confined space entry *(below barn storages)?*	No			Yes	

Systems & Management Review:
Worksheet 4: Operation and Maintenance

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Frequency of storage facility inspection:					
	High risk (risk 4)	**High-moderate risk (risk 3)**	**Moderate-low risk (risk 2)**	**Low risk (risk 1)**	**Environmental Benefits**
Manure transfer (barn to storage) and recycle systems?	No	Less frequently	Weekly	Daily OR Sensor installed to shut pump down in case of pipe blockage.	
Liquid levels?	No	Less frequently	Monthly	Weekly	
Cracks and resulting seepage through concrete? *(concrete storage)*	No	Less frequently	Quarterly	Monthly	
Storage liner erosion or damage? (earthen storage)	No	Less frequently	Quarterly	Monthly	
Berm sod cover and erosion? *(earthen storage)*	No	Less frequently	Quarterly	Monthly	
Tree and large weed growth? *(earthen storage)*	No	Less frequently	Quarterly	Monthly	
Burrowing animal damage? *(earthen storage)*	No	Less frequently	Quarterly	Monthly	
Surface water drainage away from storage structure?	No		Less frequently	Quarterly	
Seepage near outside toe of berms and around pipes through the berm? *(earthen structures)*	No	Less frequently	Quarterly	Monthly	
Electrical conductivity? *(anaerobic lagoons)*	No measurement OR Readings > 12 mmho/cm	Infrequent measurements OR Readings between 10 and 12 mmho/cm	Quarterly AND Readings between 8 and 12 mmho/cm	Quarterly AND Readings less than 8 mmho/cm	
Odor intensity?	No	Less frequently	Quarterly	Monthly	

An inspection today of the storage facility would reveal the following critical issues:

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

Monthly Manure Storage/Lagoon Inspection Checklist

Checks in shaded boxes suggests potential problem or risk.

Farm:_____ Pit/Storage/Lagoon ID:_____ Year:_____

Date												
Inspected by (initials):												

Manure/Effluent Level Observations

Depth remaining to berm low point (ft.)[1]												
Depth remaining to "Must Pump" mark (ft.)[2]												

	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is liquid level marker available & visible?																								
Does sufficient freeboard exist?[3]																								
Manure pump/transfer pipes functioning?																								
Recycle pumps/transfer pipes functioning?																								

Earthen Storage Structure

	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Interior Liner Erosion Observed:																								
Due to wave action?																								
In vicinity of inlets?																								
In vicinity of outlets?																								
Due to erosion from rainfall?																								
Near agitation equipment access points?																								
Signs of berm/dam damage due to:																								
Burrowing animals?																								
Presence of trees?																								
Presence of large weeds?																								
Erosion or gullies?																								
Poorly established sod?																								
Are there indications of:																								
Damp, soft, or slumping areas on berms?																								
Seepage near toe of berm?																								
Seepage around pipes through the berm?																								

1. Measured from liquid surface to lowest point on top of dam, berm or spillway to liquid level.
2. Measured from liquid surface to "Must Pump" mark on depth gauge. Negative value indicates depth is above "Must Pump" mark.
3. Concrete or steel storage structure...6"; Earthen storage basin or lagoon...18"; Runoff holding pond...18" + sufficient volume for runoff from 25-yr. 24-hr. storm

Monthly Manure Storage/Lagoon Inspection Checklist (Page 2)

Checks in shaded boxes suggests potential problem or risk.

Date																									
Concrete/Steel Tanks																									
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	
Signs of cracks or structural damage?																									
Signs of leakage or overflow?																									
Signs of wet spots around base of tank?																									
Clean Water Diversion																									
Are perimeter drains plugged or blocked?																									
Is roof water entering storage?																									
Is field runoff entering storage?																									
Are diversions/waterways maintained?																									
Visual Appearance and Safety																									
Is site neat and recently mowed?																									
Is storage visually hidden from public?																									
Are mortality or afterbirth observed?																									
Are medical consumables observed?																									
Is area fenced and properly marked?																									
Is escape ladder available?																									
Odor																									
Anaerobic Lagoon:																									
Is lagoon purple?																									
Is lagoon at least 1/3 full?																									
Is lagoon actively bubbling?																									
Electrical conductivity (mmho/cm)?																									
Manure storage or holding pond:																									
Is structure covered or crusted over?																									
All structures:																									
Are all inlet pipes submerged?																									
Rate down-wind odor from facility?																									

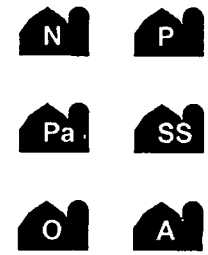
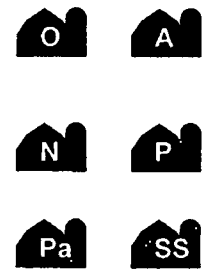
Down-wind odor from manure storage: 1...None; 2... Faint; 3...Distinct; 4...Strong; 5...Unbearable

Systems & Management Review:
Worksheet 6: Odor Control

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

	High risk	Moderate risk	Low risk	Environmental Benefits
Manure Storage Type and Location				
Relative risk associated with alternative types of manure storage system	Formed manure storage, earthen storage basin, or undersized anaerobic lagoon	Properly-sized anaerobic lagoon Partially covered manure storage Open lot runoff holding pond OR Dry manure storage where liquids are separated and drained to separated storage or absorbed by bedding.	Anaerobic digester or other treatment system is included with any manure storage, OR Purple anaerobic lagoon OR Composted manure storage OR Manure is stored for less than one week before land application. Properly covered manure storage	
Location of storage or lagoon relative to confinement animal housing (dusty ventilation air moving across storage or lagoon surface will pick up and transport additional odors).	Prevailing winds or ventilation fans direct building ventilation air across storage or lagoon surface.		Manure storage or lagoon is remotely located from animal housing. OR Prevailing winds or ventilation fans DO NOT direct building ventilation air across storage or lagoon surface.	
Earthen Basins only				
Manure surface	Manure surface is exposed and does not form a crust.	Storage is loaded below liquid surface AND Crust forms over only part of storage surface due to top loading, regular agitation, wind or other factors, Crop residue cover is in place at least six months of year during periods of greatest odor concerns, Manure surface is partially covered by crop residue, plastic membrane or other type of cover.	Storage is loaded below liquid surface AND Stored manure forms undisturbed crust over the entire surface, Manure is held in enclosed manure storage tank or completely covered year round with crop residue, plastic membrane or other type of cover, Surface aeration maintains oxygen concentration of 1 mg/liter or greater.	

	High risk	Moderate risk	Low risk	Environmental Benefits
Agitation during emptying	Storage is aggressively agitated by stream of manure directed above manure surface.	Storage is aggressively agitated by stream of manure directed below manure surface.	No agitation use during storage emptying.	
Anaerobic Lagoon only				
Signs of improved treatment for reducing odors... Active lagoons stabilize odors.	Lagoon is dark brown or black in color and shows few signs of active bubbling during warm weather.	Lagoon is dark brown or black and is actively bubbling from spring through fall.	Lagoon is maintained in aerobic state (1 hp of aeration capacity per 150 finish hogs, 50 beef or 30 dairy animals) Deep purple or red colored lagoon.	
Permanent Pool (or first stage of two stage lagoon) Size...Large permanent pools dilute incoming manure and provides a better stabilization of odors	Sizing of permanent pool is unknown or not sized according to standard engineering recommendations Animal numbers have increased above designed capacity for lagoon.	Permanent pool is sized following standard engineering recommendations	Permanent pool is sized for odor control (twice standard engineering recommendation)	
Permanent Pool Management	A permanent pool of 1/3 of the total volume or less is maintained.	A permanent pool is maintained that is at least 50% of the overall storage volume.	Markers are used to identify "Stop Pumping Point" for maintaining permanent pool Permanent pool never drops below marker.	
Lagoon loading... Frequent feeding is preferred to infrequent feeding	Lagoon is loaded less frequently than weekly Manure loading rates are highly variable.	Lagoon is loaded weekly with fairly similar quantities of manure.	Lagoon is loaded daily with fairly similar quantities of manure.	
Lagoon unloading... Infrequent pumping causes buildup of salts and ammonia that can become toxic to anaerobic bacteria	Lagoon is pumped infrequently or not at all due to evaporation and seepage generally matching liquid additions.	Lagoon is pumped annually to permanent pool marker.	Lagoon is pumped annually to permanent pool marker. In dry years, lagoon is pumped below permanent pool marker and fresh water added to marker.	
Electrical conductivity?	No measurement Readings > 12 mmho/cm	Infrequent measurements Readings between 8 and 12 mmho/cm	Quarterly measurements Readings less than 8 mmho/cm	
Open Lot Runoff Holding Pond/Settling Basins/Filter Strips				

	High risk	Moderate risk	Low risk	Environmental Benefits
Holding pond unloading	Holding pond is regularly more than half full		Liquid is dispersed through a grass filter strip. When ground in not frozen, liquid is pumped out whenever ground will accept liquid without runoff. Pond is kept dry or with minimal liquid pool.	
Draining of settling basins or channels	Liquid pools in settling basin often remaining for multiple weeks.	Liquid pools in settling basin often remaining for multiple days.	Liquids drain from settling basin and a dry solid surface is observed within a few days after a storm event.	
Drainage of open channels for transporting runoff.	Liquid pools in open channels often remaining for multiple weeks.	Liquid pools in open channels often remaining for multiple days.	All liquids drain from open channels.	
Solid Manure				
Stockpiling	Stockpiling often occurs near public roads or neighbors Precipitation and seepage pools in vicinity of stock pile.		Stockpiling is avoided for most of year and harvested manure is directly land applied. Stockpiling is done in remote locations away from neighbors All precipitation and seepage drains away from stock pile.	
Composting	Wet manure is commonly stock piled and never turned.	Crop residue is mixed with stockpiled manure but no turning of stock pile occurs.	Only dry manure (<45% moisture) is stockpiled Crop residue is mixed with stockpiled manure to achieve <45% moisture Stockpiled manure is turned weekly to encourage composting until no additional heating occurs.	

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing worksheets, identify the strengths and weaknesses of your system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Activities	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	
Long Term Goals or Changes		
1._____	High Medium Low $_____	
2._____	High Medium Low $_____	
3._____	High Medium Low $_____	

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

Activities	**Years in Which Significant Progress is Made Towards Goal?**	**Year in Which Goal is Accomplished?**
Short Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		
Long Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		

References:

MWPS

Livestock and Poultry Environmental Stewardship program, Lesson 20 "Planning and Evaluation of Manure Storage" authored by Charles Fulhage and John Hoehne, University of Missouri, Columbia

Livestock and Poultry Environmental Stewardship program, Lesson 21 "Sizing Manure Storage, Typical Nutrient Characteristics" authored by Charles Fulhage and John Hoehne, University of Missouri, Columbia

Livestock and Poultry Environmental Stewardship program, Lesson 23 "Manure Storage Construction and Safety, New Facility Considerations" by Charles Fulhage and John Hoehne, University of Missouri, Columbia

Livestock and Poultry Environmental Stewardship program, Lesson 24 "Operation and Maintenance of Manure Storage Facilities" by Charles Fulhage and John Hoehne, University of Missouri, Columbia

NRCS – Ag Water Handbook

For additional information please see the following publications which are available at Natural Resource, Agriculture, and Engineering Service (NRAES) web site (www.nraes.com)

General Agriculture

- International Conference on Air Pollution from Agricultural Operations. MidWest Plan Service, 1996. 488 pages $35.00

Dairy

- Environmental Factors to Consider When Expanding Dairies. NRAES, 1999. 44 pages $9.00

Manure and Waste Management

- Dairy Manure Systems: Equipment and Technology. Proceedings from the Dairy Manure Systems: Equipment and Technology Conference, 2001. 424 pages $30.00
- Manure Characteristics. MidWest Plan Service, 2000. 24 pages $8.00
- Waterborne Pathogens in Agricultural Watersheds. NRAES, 2001. 68 pages $9.00
- Anaerobic Digesters for Dairy Farms. Cornell University, Agricultural and Biological Engineering, 1990. 72 pages $10.00
- Circular Concrete Manure Tanks MidWest Plan Service, 1998. 23 pages $10.00
- Concrete Manure Storages Handbook. MidWest Plan Service, 1994. 72 pages $20.00
- Earthen Manure Storage Design Considerations. NRAES, 1999. 100 pages $18.00
- Guideline for Dairy Manure Management from Barn to Storage. NRAES, 1998. 36 pages $8.00
- Managing Nutrients and Pathogens from Animal Agriculture. Proceedings from the Managing Nutrients and Pathogens from Animal Agriculture Conference, 2000. $30.00
- Poultry Waste Management Handbook. NRAES, 1999. 72 pages $16.00

Composting

- Field Guide to On-Farm Composting. NRAES, 1999. 128 pages $14.00
- On-Farm Composting Handbook. NRAES, 1992. 186 pages $25.00

Any currently implemented activities or options should be identified with a "C". Any future activities or options should be identified with a "F". After completing this process, check the odor control options assembled in the summary table for a balance between management and technology options that address manure storage, animal housing, land application, and community relations issues.

Site Selection

- ■ Maintain adequate separation distance of the facility site from neighbors:
  - ☐ ½ mile minimum for swine, dairy, poultry, and beef confinement facilities. Greater distance would be recommended for neighbors downwind of facility along prevailing summer wind directions;
  - ☐ Double above separation distance to communities, schools, and recreation areas.
  - ☐ Double above distances for larger-than-average livestock facilities.
- ☐ Avoid locating facilities upwind of neighbors based on prevailing summer wind directions.
- ☐ Avoid locating up-slope from neighbors in low-lying or valley areas.
- ☐ Locate manure storage or lagoon near center of cropping area or other remote area instead of near livestock housing.
- ☐ Block visual line of site from neighbors and public roads to farm facilities.
- ☐ Utilize existing shelter belt or hill downwind of livestock facility (along line of summer prevailing winds). Typically, a windbreak to the north and northwest of the facility has greatest benefit in Nebraska.
- ☐ Other: _____

Manure Storage and Treatment Facilities

General

- ☐ Plant trees or other windbreaks downwind of storage based upon prevailing summer winds.
- ☐ Ozone is injected in storage or lagoon surface.
- ☐ Proven biological additives or oxidants are added.

Manure Storage and Settling Basins

- ■ Encourage crust development on manure storages by:
  - ☐ bottom loading storages;
  - ☐ minimizing water additions;
  - ☐ minimizing surface agitation and breakup of crust.
- ☐ Cover storage with concrete caps, floating membranes, crop residue cover, or geotextile.
- ☐ Consider wind direction before agitation of storage.

Anaerobic Lagoon Facilities

- ☐ New lagoon is filled about 1/3 full prior to loading of lagoon.
- ■ For lagoon in planning stages:
  - ☐ lagoon is sized to meet NRCS design for odor control.
  - ☐ solids are separated with settling basin or liquid solids separator.
- ■ For undersized lagoon, reduce organic solids loading by:
  - ☐ separation of solids with settling basin or liquid solids separator;
  - ☐ construction of a second lagoon operated in parallel with the original lagoon;
  - ☐ moving part of herd to a different site.
- ☐ Plant trees or other windbreaks downwind based upon prevailing summer winds.
- ☐ Manure discharge pipes extend below the surface of the lagoon.
- ☐ Lagoon is loaded daily with manure, or at least several times every week.
- ☐ Lagoon turns purple by late spring.

- ☐ Proven lagoon additives are used to treat lagoon.
- ☐ Lagoon is pumped annually to minimize toxic accumulation of salts.
- ☐ Permanent pool is clearly marked and maintained during pumping.
- ☐ Black settled solids are never exposed during pumping.
- ☐ Other: _____

Treatment Technologies

Chemical and biological treatment should be approached with caution. To date the successes with odor-control agents have been limited. These additives should generally be considered an option only after good odor management practices have failed to achieve an acceptable solution. In addition, all treatment processes deserve close scrutiny of the cost, safety and management requirements.

- ☐ Anaerobic digestion system;
- ☐ Surface aeration systems;
- ☐ Properly sized lagoons designed for odor control;
- ☐ Lagoon that turns purple by late spring;
- ☐ Settling basins and mechanical liquid-solid separators to reduce lagoon loading (collected solids must be composted or land-applied to avoid fly and odor nuisances).
- ☐ Adjust manure pH above 8;
- ☐ Add oxidizing agents (i.e. potassium permanganate or hydrogen peroxide).
- ☐ Other: _____

Neighbor Relations: Despite one's best intentions and efforts, odors from manure will always exist. A vigilant effort to find a middle ground acceptable to both you and your neighbors is constantly required. Samples of activities designed to find that middle ground include:

- ☐ Neighbors are informed of planned manure applications and encouraged to inform producer of special events that might be impacted by manure application..
- ☐ Neighbors are offered an opportunity to tour farm and meet with farm owners/managers.
- ☐ Neighbors are asked to monitor odor nuisance experiences and share information with producer.
- ☐ Support "Agriculture in the Classroom" curriculums in local schools.
- ☐ Share farm produce with neighbors when odors are particularly annoying.
- ■ Become more visible in the community by:
  - ☐ supporting a little league team;
  - ☐ participating in local chamber of commerce or other community organizations.
  - ☐ Other: _____

Range and Pasture Environmental Assessment Module

Table of Contents

Introduction

Objective
The goal of this assessment package is to help a livestock producer confidentially evaluate environmental issues that relate to range and pasture management. This worksheet will assist in:

- Assessing your operation's compliance with commonly regulated issues
- Minimizing impact of livestock on water quality
- Reduce soil erosion and sediment in surface water
- Improve distribution of manure nutrients on pastures in winter and summer
- Improve land productivity through pasture management
- Improve wildlife habitat for fun and profit
- More efficient water utilization from irrigation
- Enhancing endangered species habitat where appropriate

Environmental Benefits
Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

Reduce Nitrogen excretion

Reduced Phosphorus excretion

Reduced Pathogen risk

Improved Farm Asthetics

Reduced Suspended Solids risk

Reduced Ammonia emission

Reduced Odor risk

Financial Benefits

Why Should I Be Concerned?
Society is particularly concerned about maintaining clean water for drinking, recreational and wildlife use. Addressing problem areas can maintain or increase the productivity of the property while minimizing public concerns about agricultural impacts on the environment. Public concern could translate into water protection regulations if agriculture and industry fail to take voluntary action to do their part in protecting water quality and the environment.

Clean water is one of our greatest resources. We all need it. The livestock industry has an interest in maintaining clean waters. Throughout history, many livestock operations have been located along waterways because it made sense. Livestock operations need fresh water supplies for animal consumption to maintain good health and enhance performance. Demands on our water resources increase, we all need to take a closer look at new ways of protecting the water we all share.

Through the Clean Water Act the public demands that all waters be swim-able and fishable. It is unlawful to put animal "wastes" where they might pollute state waters. [Add here a definition of state waters relevant to your state – or – include state water definitions in glossary/appendix]

Additional Information?

How Do I Proceed?

1. It would be most beneficial if you have on hand an inventory of resources (land, animals, additional feed, etc.) available to your operation before you begin.
2. Contact your local County Extension Agent or Conservation District to find out an update of local issues of environmental concern and regulation.
3. Work through the following sections answering yes or no and proceeding to the respective question.

Regulatory Compliance Review:

Instructions:
The purpose of this worksheet is to help the farmer/rancher determine where they fall into the regulations, if at all. It will also be a means of indicating ways to avoid falling under regulation if you do not already do so. The goal is to help a livestock producer identify regulations that may apply to their operation. This assessment focuses on the plans that are required for range and pasture land.

Instructions to State Pilot Team: This is meant to be a template for you to modify to address state specific regulations before it is used by producers. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response.

Purpose:
The purpose of this worksheet is to help the farmer/rancher determine where they fall into the regulations, if at all. It will also be a means of indicating ways to avoid falling under regulation if you do not already do so. The goal is to help a livestock producer identify regulations that may apply to their operation. This assessment focuses on the plans that are required for range and pasture land.

A. AFO (Animal Feeding Operation) and CAFO (Concentrated Animal Feeding Operation)

1. Do I have less than 1000 AUs (Animal Units)?
   YES ..... Proceed to question #2

2. Is my operation considered an AFO?
   a. Animals are not kept in one location for a total of 45 days in a 12 month period with no vegetation?
      YES ..... Your operation is not an AFO, proceed to section B
      NO ..... Your operation is an AFO, proceed to #3

3. Does your operation meet either of the following criteria:
   (a) pollutants discharged into navigable waters through a man-made device,
   (b) pollutants discharged directly into waters of the United States which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation.
      YES ..... Your operation is considered a CAFO, proceed to #4
      NO ..... proceed to section B

4. A NPDES permit is required for your operation since it is considered a CAFO. You can voluntarily apply for this permit through the Montana Department of Environmental Quality. Contact Kari Smith in Helena at #(406) 444- .(each state will put their own contact in this section)

B. Watershed impairment: This section of the worksheet is to help the rancher identify the water resources his/her farm operation may be impacting. It further helps identify specific farming/ranching activities and hydro-logically sensitive areas on the landscape of the farm/ranch that may pose a potential concern to water quality.

It is important to remember, as you go through this worksheet, that what happens on the land can potentially affect the water. A water quality problem exists where a classified use is negatively impacted with reference to the State of Montana's TMDL (Total Maximum Daily Load) criteria. The effects can range from precluding a use to situations where a water body's best use is threatened.

The primary pollutants that can result from land use activities within a watershed include nutrients, sediment, toxic substances, pathogens, oxygen-demanding substances (organics) and elevated water temperatures. In any given watershed there are a number of potential sources of these pollutants such as agricultural, forestry, construction, wildlife, land disposal of waste, and modifications to streambanks or stream channels.

In many areas of the state there are watershed management plans or aquifer/wellhead protection plans that identify pollutants of concern and land uses or activities that pose a potential risk to water quality. It is important at this stage you become aware of any watershed management plans for the watershed you are in.

1. Is your farm/ranch watershed fully supporting of all designated uses according to section 303d of the Clean Water Act (aquatic life, fish for consumption, drinking water supply, swimming, boating and other minimal contact recreation, agricultural, industrial) – rating scale = Fully Supporting, Threatened, Partially Supporting, Non-Supporting. All waters not fully supporting are considered Impaired. To find out, access your state's 303d list at: www.epa.gov (TMDL web site)

   YES ..... Not Impaired, proceed to #2

   Pro-Active involvement by landowners is necessary to ensure agriculture concerns and potential problems can be addressed.

   NO ..... Impaired, proceed to #2

2. Are you actively involved in a watershed plan?

   YES ..... Proceed to section C

   NO ..... We suggest you become more informed on planning, proceed to section C

3. Are there existing water management practices that outlet directly to a waterbody?

   YES

   NO

4. Is the ranch/pasture in a floodplain?

   YES

   What is the frequency of flooding – rare, occasional, frequent?

   NO

5. Does surface water flow directly to a watercourse without riparian buffers?

   YES

   NO

6. Are there standing surface waters that border active farmland?

   YES

   NO

C. Threatened and Endangered Species

1. Do you have threatened and/or endangered species on your operation?

   YES ..... Proceed to #2

   NO ..... Proceed to section D

2. List management practices (if any) that have enhanced habitat, then go to section D:

D. Zoning and land use restriction

1. Have you contacted your local Clerk and Recorder to find out about zoning or land use restrictions?

   YES ..... Keep records of these and proceed to section E
   NO ..... Find out what they are, keep records, proceed to section E

E. Required environmental practices

1. Are there required environmental practices in public or private leases?

   YES ..... Proceed to #2
   NO ..... proceed to Site Review

2. Are you in compliance with required practices?

   YES ..... Proceed to Site Review
   NO ..... Suggest implementing a plan

Site Review: Specific to Range/Pasture Sites

Purpose

This section is designed to focus on certain aspects of your operation that may be of concern to environmental quality of the whole system

Use as many site assessment sheets as necessary to cover all pastures and/or winter feeding areas.

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environment Benefit
Runoff/Erosion Concerns					
Are plant roots well covered by the soil (no pedistalling around their base)?	The majority (75%) of plants have roots exposed at the soil surface and pedistalling is up to one inch deep.	Half of plants have roots exposed at the soil surface and pedistalling is less than half an inch deep.	Very few (less than 10%) plants have roots exposed at the soil surface and there is essentially no pedistalling.	All plant roots are well covered with soil.	
Is adequate forage cover left after grazing to prevent excessive wind/water erosion from pastures?	Less than 20-30% of the vegetation biomass is left after the grazing period and there is less than 75% plant cover in the pasture.	30-40% of the plant biomass is left and there is less than 75% of plant cover in the pasture.	40-50% of the plant biomass is left and there is 75% or greater plant cover in the pasture.	Greater than 50% of the plant biomass is left and there is 75% or greater plant cover in the pasture.	
Is there risk of off-site damage from gully, sheet or rill erosion?	Erosion sites are not controlled and perpetually get worse.	Erosion sites are not controlled or control measures have not been successful, and they show no signs of improvement.	Erosion sites are controlled, but sometimes they fail.	There is no off-site damage occurring or control measures are very successful.	
Does your operation/pasture have hydro-logically sensitive areas?	Land areas that contribute surface water runoff to rivers, lakes and reservoirs (flood prone areas, saturated soils and highly erodible lands)	Land areas which contribute subsurface water flow to recharge areas for significant aquifers (such as sinkholes and deep, well-drained, permeable soils)		None	
What is the potential risk for erosion on your operation?	There is excess water entering and leaving the site.			There is little or no excess water.	

What is the risk of water quality degradation from wastes?	There is no buffer between wastes and surface water, with animals or wastes in contact with surface water.	There is no buffer between animals and surface waters.	Animals are managed to minimize contact to surface waters, i.e. controlled water gaps, etc.	There is an effective and well maintained buffer in place.	
Where are lichen lines located on rocks?	Lichen lines are above the soil surface indicating there has been soil movement.			Lichen lines are at the soil surface indicating little or no soil movement.	
Soils and Landscapes					
Are areas of excessive soil compaction, which inhibit plant growth, rare or absent?	Soil compaction is a common problem, which limits the management of vegetation.	Soil compaction is a common problem. Management considerations taken at certain times of year.	There are slight problems with soil compaction, mainly during certain times of year, and may be inhibiting to some plant species.	There is little or no soil compaction. It is not limiting to plant growth.	
What is the slope of the pasture towards state waters?	More than 15%	10-15%	4-10%	Less than 4%	

Location of Facilities

Livestock waste contains high levels of nitrogen, phosphorus, sediments, degradable organic materials and microbes. When livestock waste is concentrated, as it is in barnyards, holding areas feedlots, the danger of pollutants reaching surface water or groundwater increases. Odors from poorly-designed and managed barnyards can also be a cause for problems with neighbors. In addition, wet, manure and mud-laden barnyards can lead to animal health problems.

Good barnyard management involves diverting clean runoff from roofs and the watershed land area above the barnyard away from the barnyard, and catching and treating, or storing, contaminated runoff.

What is the location of animal handling facilities?	Handling facilities/corrals are on or within 10 feet of a waterway and wastes have a direct path to discharge in state waters.	Handling facilities/corrals are from 10 to 50 feet away from waters, but have a direct path to discharge into state waters.	Handling facilities are greater than 50 feet away from waters and have little or no chance of discharging into state waters.	Handling facilities are greater than 100 feet away from waters and have little or no chance of discharging into state waters.	

What is the physical location of animal feeding areas?	Feeding areas are in riparian zones where the animals have full access to the natural waters and animal wastes can easily be discharged into state waters.	Feeding areas are near riparian zones where animals have access to a portion of the water body for drinking and wastes are likely to discharge into state waters in the event of spring runoff.	Feeding areas are a good distance away from water bodies but slope of the feeding area may cause discharge from catastrophic events into state waters.	Feeding areas are away from water bodies and fecal material is dispersed over the pasture. Discharges into state waters will not occur.	
What is the physical location of watering facilities?	Animals are required to drink directly from state waters with no developed access points, or alternative watering facilities are located right on the banks of the water body.	Animals are required to drink directly from state waters with minimal development of alternative water sources or access points.	Access points are developed but there are no alternative watering facilities in place.	Access points and alternative water tanks are developed and used by the animals all of the time.	
Vegetation Concerns					
What is the composition of plants in the pasture(s)?	There are few, if any, desirable species; noxious weeds are abundant; there is not a variety of perennial species present.	Less than 50% of the composition is desirable species; noxious weeds are present and becoming dominant; there are a few desirable perennial species present.	Desirable species are present; noxious weeds are rare; perennial species dominate the composition.	There is an abundance of desirable species, including a variety of perennials; noxious weeds are absent.	
Are plants well distributed across the site?	There is no distribution of desirable plant species.	There is very little distribution.	There is moderate distribution.	There is good distribution.	
If woody species are present (or should be present), are all age classes present (seedling, young, mature)?	Species that should be there are absent, or only mature plants are present.	The community is dominated by mature species, with less than 25% of plants being young and no seedlings.	The community has more than 50% mature plants with a few seedlings and less than 25% young plants.	All age classes are present and there is good distribution of age classes.	

Systems and Management Review:

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Environmental Planning					
Are acceptable environmental planning standards currently in place relative to:					
Interaction and reporting to agencies involved in pasture/range regulation?	NO			YES	
Assistance programs for pasture and range management?	NO			YES	P
Planning for management and emergencies?	NONE	MONTHLY	WEEKLY	DAILY	
Record keeping?	NO			YES	
Monitoring of systems? Range/Pastures Riparian Water Quality	NO NO NO NO			YES YES YES YES	
Grazing Management (for calculations refer to Appendix 2)					
Have you calculated stocking rates for all pastures that will be utilized for grazing each season?	NO			YES	Pa
Have you determined how much feed will be needed to support all of your animals for the year?	NO			YES	O NH_3

If you are monitoring, is your pasture in an upward trend toward (or at) a desirable state?	NO			YES	
Have you determined a harvest efficiency for each pasture? (This should be based on your answer to the above question)	NO			YES	
Based on the questions above, do you have enough forage during the growing season to sustain animals without overgrazing pastures?	NO			YES	
Riparian Area Management					
Is the stream channel narrow and deep?	The stream channel is very wide and shallow and is noticeably wider and shallower than 5 years ago.	In the past few years it has gotten noticeably wider and shallower.	There are some areas of the steam that have become wider and shallower in the past few years.	The stream is maintaining its narrow and deep structure.	
Does the stream have access to its floodplain every two years?	The stream is incised and cannot access it's floodplain due to the shallow/wide structure.	The stream has access to its floodplain at most times of every year.	The stream has access to its floodplain at least some time during every year.	The stream has access to its floodplain during normal flooding intervals of two years.	
Are streambanks anchored securely by deep and fibrous roots?	The streambanks are mostly composed of undesirable species for stabilization of the banks or bare soil.	The majority of streambanks are covered by undesirable species or bare soil with only some streambank stabilizing species present.	The streambank is about half and half desirable and undesirable species.	The streambank is mostly composed of desirable species for anchoring soils.	
Are eroding or sloughing streambanks rare?	There are several areas where the streambank is eroding or sloughing.	About a quarter of the length of the streambank is eroding or sloughing.	There are a few areas where streambanks are severely eroding or sloughing, but most of the streambanks are stable.	Eroding or sloughing streambanks are rare or absent, but if present alternating pointbars are building.	

Are noxious weeds present?	Noxious weeds are present on atleast a quarter of the streambank and they are increasing their cover.	Noxious weeds are present in various small patches along the streambank.	Noxious weeds are present in very rare, small patches.	Noxious weeds are not present.	
Are shrubs and trees (if present) of mixed ages?	Shrubs and trees are not present (if they should be there), or they are not of mixed age classes, but mostly mature plants.	Mature shrubs and trees dominate the community, with less than 25% being young and no seedlings.	The community has more than 50% mature plants with a few seedlings and less than 25% young plants.	All age classes are present and there is good distribution of age classes, or shrubs and trees are not present (if they should not be there).	
Is there adequate grass stubble height remaining (atleast 3 inches) at the end of the grazing season to slow water flow and reduce erosion during spring flows next year?	There are few, if any, areas along the streambank where adequate stubble height remains at the end of the grazing season.	Less than 25% of the streambank has adequate stubble height remaining.	Less than 50% of the streambank has adequate stubble height remaining.	Greater than 75% of the streambaknk has adequate stubble height remaining at the end of the grazing season.	
Are water-loving plants vigorous?	Water-loving plants are rare or absent and are in a state of declining vigor.	Water-loving plants are present, but the majority of them are in a state of declining vigor.	Water-loving plants are fairly abundant, but 50% of them are in a state of declining vigor.	Water-loving plants are fairly abundant in the community and they are healthy and increasing.	

Winter Feeding Areas

Is there direct drainage to waterways?	Livestock are next to or on the water, so direct drainage is very likely.	Although livestock are not located directly along the water, there is direct drainage to the water.	There is indirect drainage to the water.	There is no direct or indirect discharge into the water.	
What is provided as a watering source for the livestock?	There is uncontrolled access to the water body.	There is controlled access to the water body.	Off-site water tanks are available, but they are located close to the water body.	Off-site water tanks are available and are located far enough away from the water body to eliminate direct discharge, and they are used over 90% of the time over the water body itself.	

What level of use is allowed for the winter feeding area standing vegetation?	There is no limit to how much vegetation the livestock are allowed to consume during the dormant season.	Over 75% of growth the previous growing season is consumed during the dormant season.	Over 65% of growth from the previous growing season is consumed during the dormant season.	Although plants are dormant, only a maximum of 65% consumption of this years growth is allowed to maintain standing stubble height that can withstand spring flows and runoff.	
Where is supplemental feed located?	Supplemental feed is located in the most convenient place close to the water body where the animals are most likely to use it.	Supplemental feed is located within 100 feet of the water body.	Supplemental feed is located within 250 feet of the water body.	Supplemental feed is located more than 250 feet from the water body to encourage animals to use more of the pasture and to avoid direct discharge into the water body.	
Are winter feeding areas located along water bodies?	The feeding area is the same location every year within 50 feet of a water body.	The feeding are is the same location every year within 100 feet of a water body.	The feeding area is within 200 feet of a water body, and rotated at least once a month.	The feeding area is located on a hillside, hilltop, or far enough away from a water body and sites are not used more than 2 weeks per year.	
How are the animals fed?	Same site is used every day.	There are two feeding spites used alternately.	There are several feeding spites in proximity to one another.	A different feeding site is used each day for the entire feeding season.	
Where are sheltered areas located?	There is one sheltered area which is located along a water body and largely consists of woody vegetation.	There are more than one sheltered areas along the water body where dense vegetation provides shelter.	Man-made shelters are provided but are located in permanent sites away from water.	Portable shelters are provided and moved at least every 2 weeks.	
How is manure concentrated in the feeding area?	Livestock are fed in small areas so manure concentration is very high.	Livestock are not encouraged to use the whole pasture so manure tends to be concentrated in small areas near water or shelter.	Livestock are fed over a large enough area that manure concentration is moderately distributed or manure is mechanically spread, i.e. harrowed, etc.	Livestock are fed over a large enough area so no manure build up is noticeable 1 month into the growing season.	
What is the slope of the wintering area?	Steep slope (>15%)	Fairly steep (10-15%)	Moderate slope (5-10%)	Shallow slope (<5%)	

What is the flooding hazard in the feeding area?	Winter feeding area is in the streams normal 2 year flood plain.	Winter feeding area is in the streams 10 year flood plain.	Winter feeding area is in the streams 25 year flood plain.	Winter feeding area is not in the streams 100 year flood plain.	
Does surface runoff water have access to winter feeding and bedding areas?	Upslope runoff water runs directly through the feeding and bedding areas into a water body.	Upslope runoff water is partially diverted away from the water body.	Upslope runoff water is totally diverted away from the water body.	No upslope runoff water passes through the site.	
Is the feeding pasture the same every year?	The same winter feeding area is used every year.			A different winter feeding site is used every year.	
What is the location of the winter feeding area to water?	A water well is located in or next to the winter feeding area.	A water well is located within 100 feet of the feeding area, or is down slope from the feeding area.	A water well is located between 100 and 200 feet of the feeding area.	All water wells are more than 200 feet from feeding area and are up slope.	
How long are the animals in the winter feeding area?	> 5 months	3-5 months	1-3 months	< 1 months	
Is there a buffer zone between the feeding area and the water body?	There is no buffer zone.	There is residual annual vegetation cover of 30 feet between feeding area and water bodies.	There is perennial vegetation and or aftermath of 30 feet or more between feeding area and water bodies.	There is a perennial buffer zone at least 50 feet wide.	
Does any manure distribution occur?	There is no distribution of manure.	Manure distributed by mechanical harrowing, tillage, etc..	Manure is well distributed and not noticeable at the end of the growing season.	Manure is distributed and not noticeable 1 month into the growing season.	

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing worksheets, identify the strengths and weaknesses of you system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Goals or Changes	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	
Long Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	

Identification of Strengths, Weaknesses, & Priorities (continued)

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

Activities	Years in Which Significant Progress is Made Towards Goal?	Year in Which Goal is Accomplished?
Short Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		
Long Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		

Review of Options:

Land Application Environmental Assessment Module

Table of Contents

Introduction

Objective
The goal of this assessment package is to help a livestock or poultry producer confidentially evaluate environmental issues that relate to land application of manure. This worksheet will assist in:

- Assessing of your operation's compliance with commonly regulated issues;
- Continuing to improve design and management of your land application system to minimize impacts on soil, water, and air resources;
- Maximizing your economic return from your on-farm nutrient resources.

Environmental Benefits
Assessment tools in this module will use the following key to identify the specific environmental or economic benefit resulting from a low risk response to an individual issue:

Reduce Nitrogen excretion

Reduced Phosphorus excretion

Reduced Pathogen risk

Improved Farm Asthetics

Reduced Suspended Solids risk

Reduced Ammonia emission

Reduced Odor risk

Financial Benefits

Why Should I Be Concerned?
Society is particularly concerned about maintaining clean water for drinking, recreational and wildlife use. Odors and air pollution are also significant issues in some areas. Addressing problem areas can maintain or increase the productivity of the property while minimizing public concerns about agricultural impacts on environmental quality. Public concern could translate into water protection regulations if agriculture and industry fail to take voluntary action to do their part in protecting water quality and the environment.

Land application of animal manure can represent significant sources of nutrients, pathogens, and odor. Runoff and erosion from these areas can transport these pollutants to streams and rivers resulting in impaired water quality. Sediments, nutrients, and pathogens are the most common surface water impairments from agricultural land. Properly managed land application areas are one of the most effective measures to reduce these impacts. Improper handling or management of manure can result in nitrogen leaching which can result in contaminated drinking water. Poor quality drinking water presents significant health hazards to both humans and livestock. Therefore, it is important that all management practices associated with the land application of manure be evaluated and continuously improved.

While the nutrients in livestock waste need to be managed, they can also provide an excellent source of fertility and soil quality improvement. Proper management of these nutrients will help you maximize the economic return on your operation

(Additional Information? Text should be Times New Roman, 11 point plain text)

How Do I Proceed?
This portion of the assessment focuses on the land application component of your operation. If you do not land apply manure or other fertilizers, then this section may not apply to your operation. While the tool is designed to assess manure application practices, it most of the issues

also apply to other sources of fertility. It is also important to manage your nutrient applications by considering all sources of fertility so do not exclude areas that never or rarely receive manure applications.

The assessment is broken into six major sections. The first section is the *Regulatory Compliance Review* that looks at the regulations that your operation should comply with and assesses your knowledge of and compliance with these regulations. This is followed by the *Site Review* that should provide you with a better understanding of the environmental risks associated with the soil and site characteristics. While these characteristics may be difficult to modify, your understanding of these risks will allow you to manage the operation to reduce environmental impacts. The *Environmental Planning Review* can be used to determine if your manure utilization is well planned and documented. Most animal feeding operations should have some sort of comprehensive nutrient management plan that dictates how manure will be used on the farm. This section will allow you to assess this plan. The *Systems and Management Review* is the final assessment tool. It looks at management and equipment issues associated with your land application system. Since your management will often determine whether your manure is an asset or liability to your operation, this tool can help you insure that you are aware of the things you are doing that may increase your risk. After completing each of these assessments you will be ready for the section on *Identification of Strengths, Weaknesses, and Priorities.* In this section, you will be requested to review the issues that have be raised throughout the land application assessment and develop a plan for continuous improvement. The final section is called *Review of Options.* It is an optional section that provides you with more detailed tools. Many of these tools may be referenced in the assessment portion while others may simply provide for a more detailed analysis of certain aspects of your operation.

Remember, the goal of this tool is to help you and it is a completely voluntary assessment. If you do not want to complete certain portions or are unsure of your answers, feel free to either seek further assistance from trained professionals or simply skip that question. Hopefully, the tool will not only identify environmental risks, but also help you improve the profitability of your operation.

Regulatory Compliance Review:

Instructions: The goal of this assessment package is to help a livestock or poultry producer identify regulations that apply their operation. For each issue listed (left hand column) of the worksheets, identify if this issue is regulated by federal, state, or local authorities (middle column), and determine if your operation is in compliance with these rules (right hand column).

Instructions to State Pilot Team: *This is meant to be a template for you to modify to address state specific regulations before it is used by producers. If a listed regulatory issue is relevant to your state's regulations, insert a summary of your state's regulations. If the regulatory issue is NOT relevant, delete the entire row containing the issue, summary, and producer response. Current federal NPDES regulations do not address nutrient management planning. Thus no summary of federal rules are included.*

Site Characteristics The goal of this tool is to help a livestock or poultry producer identify regulations related to land application site characteristics that apply to their operation.

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Is my livestock/ poultry operation in compliance?
What agency(ies) is(are) involved in administrating regulations related to nutrient management?	___ US EPA ___ State ___ Local *List Name, Address, Phone #:*	
Site Characteristics		
Do regulations restrict manure application sites based upon distance to surface water?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do regulations restrict manure application sites based upon slope?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do regulations restrict manure application sites based upon flooding potential?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do regulations restrict manure application sites based upon soil type?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do regulations restrict manure application sites based upon depth to ground water or fractured bedrock?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

If a neighbor's land is used for manure application, is a signed agreement with that land owner required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Manure Utilization Plan The goal of this assessment tool is to help a livestock or poultry producer identify regulations that apply their operation. This assessment focuses on the plans that are required for manure use. These may be called comprehensive nutrient management plans (CNMP's), nutrient management plans (NMP's), or something else in your area. The requirements for each of these plans may also vary.

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Is my livestock/ poultry operation in compliance?
Manure Utilization Plan		
What agency (or agencies) is (are) involved in administering regulations relating to manure (waste) utilization plans?	___ US EPA ___ State ___ Local *List Name, Address, Phone #:*	
Are manure utilization plans required to be certified and if so, by whom?	*List Name, Address, Phone #:*	
Is a manure utilization plan required for your farm?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
What nutrients must be addressed in your manure utilization plan?	___ N ___ P ___ Cu ___ Zn	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there regulations specific to phosphorus that are applicable to your livestock or poultry operation?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Do these regulations limit soil P accumulation based upon: 1. An agronomic soil test level (only P needed to grow a crop? 2. An environmental soil P threshold? 3. A P Index that considers multiple transport and source factors?	1. ___ Yes ___ No If Yes, summarize: 2. ___ Yes ___ No If Yes, summarize: 3. ___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are limits set for residual soil nutrients?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is documentation required of available land base for managing manure nutrients?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is manure sampling required for nutrient concentration?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Is soil sampling required on manure application sites?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Are manure generation rates part of the manure utilization plan, or are you required to keep records of manure generation?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are there requirements for off-site manure transport or application on non-owned fields?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to account for supplemental nutrients such as legume residual, commercial fertilizer, etc. as part of your manure utilization plan?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Best Management Practices The goal of this tool is to help a livestock or poultry producer identify Best Management Practices required by current regulations.

Regulatory Issue	Summary of Current Regulations (Reviewer: Is this issue addressed by regulations? If "Yes", summarize those regulations)	Is my livestock/ poultry operation in compliance?
Best Management Practices		
Are specific BMPs required?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to maintain records for: - Crop yields - Manure sampling - Soil sampling - Manure application rates - Manure storage levels - Restricted Use Pesticides - Other:_____	___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to submit an initial or annual reporting of: - Crop yields - Manure sampling - Soil sampling - Manure application rates - Manure storage levels - Other:_____	___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize: ___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
If records are required, for how long must these records be available for inspection by regulatory agencies?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are specific structures or practices required on your farm to prevent or minimize spills?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
If irrigating, does your irrigation system have to be designed or reviewed by a Professional Engineer or Certified Irrigation Designer?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to calibrate your application system? How often?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to have safety features installed or plans developed to minimize discharges or spills?	___ Yes ___ No If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Are you required to monitor ground or surface water coming from land application areas?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to hold, treat, or divert ground or surface water running onto or off of land application areas?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to have a certified operator in charge of land application?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to implement special requirements for pesticide applications on land application areas?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to post notification after pesticide applications?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to inspect application sites following manure applications? When?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to have an Emergency Action Plan to address spills during manure application?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know
Are you required to contact a regulatory agency following a spill or manure runoff?	___ Yes ___ No	If Yes, summarize:	___ Yes ___ No ___ Not applicable ___ Don't Know

Site Review:

Objective: To insure that manure is being applied based on Soil Characteristics

Do the soils on current land application sites present any specific environmental risks? This assessment tool will assist a livestock or poultry producer in a confidential evaluation of environmental issues that relate to soil characteristics of land application sites.

This tool can be completed for each field that receives manure or similar fields can be combined. Most of this information is available in your NRCS County Soil Survey. You should consult with your Soil and Water Conservation District or local NRCS office to obtain information on each soil type within your fields. For each issue listed in the left-hand column of the worksheet, read across to the right and check the statement that best describes conditions for the majority of the field. Leave categories that don't apply blank.

Upon completion of this evaluation for common manure application sites, use this information to 1) select preferred land application sites; 2) identify higher risk application sites; 3) determine sites requiring additional conservation management practices to offset higher risks associated with soil characteristics. This information should be considered in developing and updating your manure utilization plan.

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Soil Characteristics					
Available Water Capacity (see Engineering Properties of Soil , County Soil Survey)	Less than 3 inches	3 to 5 inches	5 to 7 inches	More than 7 inches.	N, P, S
Soil Erosion Potential	Soil is highly erodible, k>0.24	Soil somewhat erodible, k > 0.20	Soil slightly erodible, k > 0.15	Soil is not very erodible, k < 0.15	P, S
Highly Erodible Areas	Several areas of field erode regularly every year.	Some spots show noticeable erosion after very intense rainfall events.	Some noticeable erosion occurs after large rainfall events but most highly erodible areas are grassed or removed from production.	No areas in field show signs of erosion. Highly erodible areas are grassed or removed from production.	P, S
Soil Drainage Class	Poorly Drained	Somewhat poorly drained.	Somewhat well drained	Well Drained	N, O
Soil pH	pH is less than 4 or greater than 9	pH is less than 5 or greater than 8	pH is between 5 and 6	pH is between 6 and 8	C
Salinity	More than 16 mmhos/cm	12 to 16 mmhos/cm	8 to 12 mmhos/cm	Less than 8 mmhos/cm	C

Objective: To insure that manure is applied based on Site Characteristics

The goal of this assessment is to help a livestock or poultry producer to confidentially evaluate environmental issues that relate to characteristics of land application sites. For each issue listed in the left-hand column of the worksheet, read across to the right and check the statement that best describes conditions for each of your fields. Leave blank any categories that don't apply.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Site Characteristics					
Slope of soils with: - Annual crops - Perennial crops	Slopes greater than 10% Slopes greater than 15%	Slopes of 7 to 10% Slopes of 12 to 15%	Slopes of 4 to 7% Slopes of 8 to 12%	Less than 4% Less than 8%	
Depth to highest seasonal ground water or fractured or permeable bedrock	Less than 2 feet	2 to 4 feet	4 to 6 feet	Greater than 6 feet.	
Flooding Potential	More than 50 times in 100 years	20 to 50 times in 100 years	1 to 20 times in 100 years	Less than 1 times in 100 years.	
Distance of application site from wells	Less than 100 feet	100 to 300 feet and well is at same or lower elevation than application site.	100 to 300 feet and well is at higher elevation than application site.	Greater than 300 feet	
Distance of application site from surface water	Land application site borders surface waters with less than 30 foot vegetated buffer zone.	Land application site borders surface waters with 30 to 50 foot vegetated buffer zone	Land application site borders surface waters with 50 to 100 foot riparian or buffer zone	Land application site more than 100 foot from surface water.	
Distance of application site from neighbors	Less than 200 feet	200 feet to 1/4 mile	1/4 mile to ½ mile	Greater than ½ mile	
History of field	Field has received other municipal or industrial wastes that have built metal or toxic materials content above allowable levels.	Field has received other municipal or industrial wastes that have built metal or toxic materials content close to allowable levels	Field has received other municipal or industrial wastes at some time in the past.	None	
P levels in soil	Soil Tests indicate very high or excessive levels	Soil tests indicate high levels	Soil tests indicate moderate levels	Low soil test levels	
Tile Drainage	Site includes field drains discharging to ground water OR Site includes field drains discharging to surface water	Site includes field drains to ditches or grassed waterways connected to surface water during some storm events and high water periods	Site includes field drains to ditches or grassed waterways but drainage rarely or never reaches surface water.	No field drains	

Unused or Abandoned Wells	Unused, unsealed well in area where manure is applied	Unused, unsealed well in area where manure is applied, but direct application is avoided	Unused wells capped and protected	No unused or abandoned wells	

These two assessment tools should provide an adequate review of your land application sites. If some of your fields have high environmental risks, it is important for you to weigh these risks to determine which fields should be used to reduce your risk. In the *Review of Options* section, a Field Selection Tool is provided that may assist you in weighing these risks.

Objective: To insure that Manure Utilization is well planned and documented

This assessment tool will assist a livestock or poultry producer in a confidential evaluation of current manure utilization planning efforts. Both the USDA and the EPA agree that one of the best ways to insure that environmental risks are minimized is to insure that manure application is well planned and documented. In fact, most states require some type of manure utilization or nutrient management plan on larger animal feeding operations and encourage farmers to voluntarily develop these plans on smaller operations. Sometimes these plans are called comprehensive nutrient management plans (CNMP's), permit nutrient management plans (PNMP's) or simply nutrient management plans. Regardless of terminology, this tool is designed to assess your written documentation of you manure utilization plans. For any bulleted items contained in the tables, check in the provided space if the statement or item applies to you.

Planning Information and Resources					
Maps Availability:		**Manure System Information:**		**Farm Management Planning:**	
Aerial photographs, topographic maps, tax or property maps are available showing:		• Animal Inventory and approximate amount of waste generated	____	• Farm Conservation (including erosion control) Plan	____
• all fields with identification and field acres	____	• Type of treatment and handling system	____	• Crop plan identifying crops to be grown, realistic yield goal, and past yield records.	____
• soil types, highly erodible sites, and wetlands, and surface waters	____	• Storage volume, estimated days of storage, cleanout schedule	____	• Manure and Fertilizer Application Rates on each field	____
• surrounding topography	____	• Application equipment volumes and daily application capacity	____	• Record of recent soil tests results	____
• residences, public facilities, etc.	____				
• property boundaries	____	• Calibration and maintenance records for all application equipment including application rates and uniformity of distribution	____	• Records of recent manure analysis results.	____
• wells and drainage systems	____			• Mortality Management Plan	____
• roads and approximate location	____			• Closure Plan for lagoons	____
				• Emergency Action Plan	____

____ High Risk (risk 4) = Incomplete or no information available.
____ High-moderate risk (risk 3) = Less than half of the recommended information available.
____ Moderate-low risk (risk 2) = Most information is available.
____ Low risk (risk 1) = All information is available.

Planning Information and Resources continued...

For each issue listed in the left column of the worksheet, read across to the right and circle the statement that best describes conditions on your farm. Leave blank any categories that don't apply. For any bulleted items contained in the tables, check in the provided space if the statement or item applies to you.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Manure Nutrient Planning					
Has an assessment been completed of the volume of manure and process water (e.g. flush water, clean up water) that must be handled annually and the ability of your land application equipment to handle this volume in a reasonably timely manner.	Yes, an estimate of the number of loads, trips, or operating hours for the land application equipment has been made. However, insufficient equipment is available for handling manure in a timely manner. OR No estimate has been made.			Yes, an estimate of the volume of manure to be handled annually and the number of loads, trips, or operating hours for the land application equipment has been made. Sufficient equipment is available for handling manure in a timely manner.	
Annual Plan for Nitrogen					
Is an estimate of "crop-available" manure nitrogen for common application rates and methods made?	No, a recent estimate is not available		Yes, an estimate has been made within the last three years for common manure application rates and methods.	Yes, an estimate is made annually for common manure application rates and methods.	
Is a nitrogen balance constructed for all fields receiving manure?	No, a nitrogen balance has not been constructed for any fields receiving manure.		Yes , a nitrogen balance has been constructed for some fields receiving manure. OR Yes, a nitrogen balance has been constructed in recent years (not this year) for field receiving manure.	Yes , a nitrogen balance has been constructed for all fields receiving manure and sufficient acreage is available.	

What nitrogen credits are considered?

- Manure N from this year's application _____
- Manure N from past years' application _____
- Soil residual nitrate levels _____
- Past year legume N credit _____
- Other organic materials such as compost, municipal or industrial sludge _____
- Irrigation N Credit _____
- Commercial fertilizer N credit _____
- Inputs from Pastured Animals _____

_____ High Risk (risk 4) = Nitrogen credits are not considered.
_____ High-moderate risk (risk 3) = Less than half of the nitrogen credits are considered.
_____ Moderate-low risk (risk 2) = Most nitrogen credits are considered.
_____ Low risk (risk 1) = All nitrogen credits are used and considered.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Annual Plan for Phosphorus					
Has an estimate of "total" or "crop-available" manure phosphorus for common application rates and methods been made?	No, a recent estimate is not available		Yes, an estimate has been made within the last three years for common manure application rates and methods.	Yes, an estimate is made annually for common manure application rates and methods.	
Is a soil test for phosphorus conducted regularly?	No, a recent soil phosphorus test is not available for most fields receiving manure.	Old soil phosphorus test results for some fields exist.	Most fields receiving manure have been tested for soil phosphorus levels in past three years.	All fields receiving manure have been tested for soil phosphorus levels in past three years.	

Systems and Management Review:

Objective: Land Application Records and Sampling

The goal of this tool is to help a livestock or poultry producer confidentially evaluate environmental issues related to their own land application records and sampling programs. For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm. For any bulleted items contained in the tables, check in the provided space if the statement or item applies to you.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Record Keeping					
Potential records to be kept: • Manure sampling and analysis _____ • Soil sampling and analysis _____ • Plant tissue sampling and analysis _____			• Record of manure applicator calibration results _____ • Manure application records _____ • Crop yield records _____ • Manure storage level records _____		
Availability of records	No data collection and record keeping program exists.	Data collection and record keeping program is incomplete and inconsistent.	Data collection and record keeping program has been developed and will be fully implemented in near future.	Data collection program has been implemented AND complete records are available for the past five years. (or will soon be available under current schedule)	
Use of records	Records are incomplete or non-existent, and are not useful.	Records are maintained but historical data is not very useful. OR Records are available but are not used in developing next year's manure utilization plan.	Some records are annually reviewed, summarized, and used to modify next years manure utilization plan.	Most or all records are: annually reviewed, summarized, and used to modify next years manure utilization plan. Use of new technologies such as GIS, GPS in conjunction with record keeping.	

Land Application Records and Sampling continued...

For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Soil Sampling Practices					
Sampling frequency	No soil testing.	Cropland fields are tested every 7+ years; vegetable crop fields are tested every 3-4 years.	Cropland fields are tested every 4-6 years; vegetable crop fields are tested about every other year.	Cropland fields are tested every 3 years; vegetable crop fields are tested once a year.	
Soil sample procedures	No soil sampling practices have been implemented.	Two or less of the "Low Risk" soil sampling practices have been implemented.	Three of the "Low Risk" soil sampling practices have been implemented.	At least 8 cores are taken from 5 acres or less, at least 2 are taken from each single field. Individual samples should represent obviously different slopes, soil colors, and soil textures if those areas are to be fertilized independently. Sample depth is appropriate for specific planned crop. Samples are collected with only stainless steel, chrome-plated or plastic tools and buckets.	

Land Application Records and Sampling continued...

For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Manure Sampling Practices					
Manure nutrient content	Nutrient content unknown	Nutrient content estimated from book values.	Nutrient content estimated from outdated analyses	Manure Nutrient content determined by recent laboratory analysis.	
Frequency of manure sampling	Manure sampling is non-existent or inconsistent	Manure sampling is done annually	Manure samples are collected each season that significant amounts of manure are land applied	Manure samples are collected regularly during each season that significant amounts of manure are land applied, or when conditions change.	
Representative Samples Taken? (anaerobic lagoons)	Sample is taken from a single location	Some but not all of "Low Risk" sampling practices are implemented.		Sample submitted to lab is pooled from 8 samples taken from lagoon perimeter at depth of about 1 foot about 6 feet from the bank.	
Representative Samples Taken? (solid manure)	Sample is taken from a single location or single time during open lot cleaning.	A pooled sample includes samples from less than 8 locations or 8 times during open lot cleaning.	At least two of the low risk practices to the right are implemented	1) A pooled sample is collected from 8 locations within a manure or compost pile that is representative of the full depth of the pile, OR 2) A pooled sample is collected from at least 8 location of a dry litter or bedded pack manure in a barn, OR 3) A pooled sample is collected at 8 evenly spaced times during open lot cleaning.	

Objective: To insure that appropriate Best Management Practices are used in land application areas.
The goal of this tool is to help a livestock or poultry producer confidentially evaluate environmental issues related to the characteristics of land being applied upon. For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Best Management Practices for Land Application Areas					
Manure Application Timing	Manure applied nearly everyday, or when lagoon or manure storage facility needs emptying or applied during wet weather.	Manure applied without regard to plant growth or season, however wet weather is generally avoided.	Manure applied as near as possible to times when crops need fertilization.	Manure applied during active crop growth and avoided during wet weather.	
Manure distribution	Manure is applied to same fields every year without any consideration of nutrient credits or crop rotation. Manure applied to fields with high soil test phosphorus (P) values, at rates exceeding crop nutrient removal.		Manure is applied to as many fields as possible at rates not exceeding crop nutrient need.	Manure applied only to fields with optimum or lower soil test P values. Applications not to exceed crop nutrient need.	
Run-off Control	No run-off controls or BMP's in place.	Some controls in place, less than half of the run-off directly enters streams or unvegetated ditches.	Most surface run-off controlled using more than one BMP; little run-off directly enters streams or unvegetated ditches.	All surface run-off controlled using at least three BMP's, such as: filter-strips, vegetated water ways, strip crops or streamside buffer. No direct discharge into streams or unvegetated ditches.	
Groundwater Protection	[see soils section]				
Crop Rotations	Continuous cropping of the same crop more than three years without winter cover or significant residue is used.	Some crop rotation with limited fallow periods, or a continuous cropping system with winter cover is used.	Crop rotation including a winter cover crop or significant residue is used each year.	All rotations include a different crop and winter cover each year, and at least one legume is in the rotation.	
Tillage Systems/Cover Crops	Tillage or soil preparation in the fall. Cover crops never used and/or crop residues never left.	Tillage or soil preparation in the spring. Less than 15% residue cover after planting.	Conservation tillage used when possible, most crops are planted into at least 30% residue cover.	Conservation tillage system in place and crops are always planted into at least 30% cover.	
Buffers	No buffers in place.	Buffers around some wells, ponds, sinkholes or other water related areas.	Buffers 10 to 50 feet around all wells, ponds, sinkholes or other water related areas.	Buffers greater than 50 ft. around all wells, ponds, sinkholes or other water related areas.	

Buffer Composition and Maintenance	Buffer has little or no vegetation and is fertilized with non-manure inputs.	Buffers are somewhat vegetated, but are not fertilized with P (phosphorus).	Well vegetated buffers, no nutrient applications of any sort.	Buffers are well vegetated, receive no nutrient application or grazing and are well maintained.	
Soil conservation	No conservation plan being followed. Visible evidence of soil erosion.	A conservation plan is being followed but the plan allows erosion in excess of tolerable soil loss.	A conservation plan is followed only on designated highly erodible land acres. These acres are not planned to exceed tolerable soil loss.	A conservation plan is followed that is at or below the tolerable soil loss.	

The goal of this tool is to help you evaluate BMP implementation effectiveness. For each BMP listed in the left-hand column, indicate whether or not this practice has been implemented on most land application sites and identify which water quality issues are addressed by this practice (indicated by box under appropriate water quality issue).

BMP's	This BMP has:		If implemented this practice will reduce:			
	Not Been Implemented	Been Implemented	Nutrient transport to groundwater	Nutrient transport to surface water	Pathogen transport to surface water	Soil Erosion
• Manure utilization plan	___	___	X	X	X	
• Manure testing program	___	___	X	X		
• Application equipment calibration	___	___	X	X		
• Soil testing program	___	___	X	X		
• Grassed or forested buffers between crop land and surface water	___	___		X	X	X
• Implemented erosion control plan	___	___		X	X	X
• Winter cover or scavenger crops	___	___		X	X	X
• Manure injection or incorporation	___	___	X	X	X	
• Post application site inspection	___	___		X	X	
Record keeping for:	___	___				
• Yields	___	___	X	X		
• Manure application rates	___	___	X	X	X	
• Manure test results	___	___	X	X		
• Soil test results	___	___	X	X		
Emergency action plan	___	___	X	X	X	

Low Risk: For one to achieve a low environmental risk, the BMP program must include: Check options that have been achieved.

- ☐ A manure utilization plan plus supporting testing and record keeping programs to document the plans implementation,
- ☐ A balance in addressing all four water quality issues.
- ☐ In local situations where a specific water quality issue is a higher priority, multiple practices that address this specific issue.

Objective: Land Application Equipment

The goal of this tool is to help a livestock or poultry producer confidentially evaluate environmental issues related to their own land application equipment and transportation/delivery systems. For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Land Application Equipment					
Selection and Calibration of Application Equipment	No calibration or estimates of application.	Application estimated based on amount applied to field.	Equipment calibrated once a year, but consistency of distribution is unknown.	Manure is applied by equipment that has been calibrated and checked yearly.	
Methods of Application	Equipment is NOT designed for type of waste, and CANNOT handle anticipated volumes in a reasonable period of time.	Equipment will suffice for type of waste, but probably will NOT be able to handle anticipated volumes in a reasonable period of time.	Equipment is designed for type of waste, and can handle anticipated volumes in a reasonable period of time.	Equipment is designed for type of waste, and can handle over the average anticipated volumes in a reasonable period of time.	
Irrigation Scheduling	No knowledge of crop water requirements or crop water use rates. Soil characteristics not considered in irrigation decision making.	Irrigation scheduling based on visual crop appearance and water stress indicators. Amount applied is not adjusted to fit crop water use.	Aware of crop water use information, but do not routinely monitor field conditions. Amount applied is adjusted to fit crop water use.	Irrigation scheduling and amounts based on site specific crop and soil measurements and weather data.	
Irrigation Volume/Rate	Sprinkler application rate greatly exceeds soil intake rate; considerable water movement over field surface.	Sprinkler application rate greatly exceeds soil intake rate; some water moves off field surface and some ponding occurs in low spots.	Sprinkler application rate about equal to soil uptake rate; some ponding occurs in low areas, but no off-site movement.	Sprinkler application rate, lower than soil uptake rate, no ponding occurs.	
Irrigation System Evaluation	System has not been evaluated for irrigation efficiency and uniformity.	Have some knowledge or information on irrigation efficiency or uniformity for designed system.	System has been professionally evaluated for irrigation efficiency and uniformity and some recommendations have been implemented.	System has been professionally evaluated for irrigation efficiency and uniformity and ALL recommendations have been implemented.	
Maintenance	Maintenance only occurs to address obvious problem, or no maintenance is done.	Some random preventative maintenance is performed.	Maintenance and inspection meets manufacturers recommendations.	Equipment inspected before every use. Maintenance exceeds manufacturers recommended schedule for service on irrigation and application equipment.	

Piping and Transport Inspection	No consideration given to piping, delivery systems, or vehicles.	Piping, delivery systems, and vehicles minimally maintained, only when an obvious problem occurs.	All piping, tanks, transport systems, and vehicles are regularly inspected at least once a year. Minimal leaks or lost material during transportation.	All piping, tanks, transport systems, and vehicles are regularly inspected and free of leaks. Vehicle appearance appropriate, loads secure and covered.	

Objective: Odor and air quality

The goal of this tool is to help a livestock or poultry producer confidentially evaluate environmental issues related to odor and air quality as a result of land applied waste. Many of these deal with social concerns or the public and community perception of agriculture. A positive appearance does not imply regulations have been followed or all BMP's implemented. For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Odor and Air Quality					
Neighbor Relations and Considerations (generally respect a 2 mile radius)	Neighbors are not notified in advance of odorous activities (applications), neighbor's complaints or inquiries have gone unanswered. Farm owner/manager are distant from community.	Some neighbors approached about odors; complaints are largely unaddressed, and seldom acted on.	Most neighbors approached about odorous activities; complaints are addressed , but acted upon slowly.	All neighbors receive prior notification of odorous activities; complaints or inquiries are always addressed in a timely fashion. Farm owner/manager are active members of the community.	
Appearance and Public/Neighbor Perception	General unorganized appearance with manure piles in plain view.	Minimal efforts to maintain a clean and organized appearance are made. Manure piles in plain view of public.	Facilities appear well maintained. Manure piles are generally hidden from public view.	Manure piles well hidden from view, site is neatly landscaped and well groomed. Appearance of facilities is well maintained.	
Topography/Location	Neighbors are located at lower elevation or in a valley below application site.	Open flat terrain exists between neighbors and application site.	Neighbors are separated from application site by a ridge or hill.	Neighbors are separated from application site by a ridge or hill as well as an additional shelter-belt or woods.	
Manure Control and Handling	Handled as a slurry or liquid, manure spilled during loading.	Semi-solid with no dry organic matter additions.	Solid with limited dry organic matter. Minimal accumulation of manure around facilities or housing.	Solid with substantial dry organic matter additions. All manure is contained and not allowed to collect around facilities or housing.	

Dust Control	No efforts have been made to control dust.	Few efforts have been made to control dust.	At least two dust control methods are implemented. (see right).	Three or more of the following are implemented: manure piles are kept covered and protected from wind; diet and bedding contain sufficient moisture, or are sprayed to reduce dust; do not apply manure on days with strong winds, or winds blowing towards populated areas.	
Timing of Manure Application	Manure is applied on weekends and holidays and during the late afternoon when the air is warm and stagnant.	Manure is applied in the afternoon.	Manure is applied in the early morning.	Manure is applied on weekdays in the early morning.	
Spray Considerations	Spraying takes place in high wind events.	Spraying takes place when the wind is greater than 20 mph.	Spraying takes place when the wind is less than 15 mph.	Spraying takes place when the wind is less than 10 mph.	

Objective: Other issues

The goal of this tool is to help a livestock or poultry producer confidentially evaluate issues that may be similar to, or related to the activity of land application of waste. For each issue listed in the left-hand column, read across to the right and circle (or check) the statement that best describes management practices on your farm.

Issue	High risk (risk 4)	High-moderate risk (risk 3)	Moderate-low risk (risk 2)	Low risk (risk 1)	Environmental Benefit
Other Issues					
Worker Protection and Training, for application of restricted use pesticides.	Many workers and handlers do not have Worker Protection Standard (WPS) training.	Some workers have WPS training.	Most workers and handlers do have (WPS) training.	All workers are fully trained according to the U.S. Environmental Protection Agency WPS.	
Applicator Training (pesticide)	Neither applicator nor supervisor is a certified applicator and certified supervisor is frequently out of contact during applications.	Supervisor is certified and usually present during application.	All applicators have certification, or they are closely supervised by a certified applicator.	All applicators have pesticide certification, and keep current on other pest control strategies.	
IPM	Pesticides are the only means used to control pests.	Pest management may include components in addition to pesticides, but their inclusion is haphazard and not planned.	Pest Management includes at least two other components in addition to pesticide controls.	Pest Management includes all available options (e.g., crop rotation, bio-control, resistant cultivars), in addition to pesticides.	

Label/Instructions	Do not read label directions or manufacturers recommendations. Product is used in direct violation of label.	Follow some directions some of the time.	Follow most label directions, most of the time. Instructions are considered at purchase, before storage and use.	Label instructions are read before purchase, storage, use and or disposal. Directions and recommendations are always followed closely.	
Training	Equipment operator not aware of, or educated on any of the issues related to land applied waste, such as, but not limited to: odor, potential water impacts, existing soil conditions, plant type and regulatory concerns.	Equipment operator vaguely aware of, or somewhat educated on any of the issues related to land applied waste, such as, but not limited to: odor, potential water impacts, existing soil conditions, plant type and regulatory concerns.	Equipment operator aware of, or educated on most of the issues related to land applied waste, such as, but not limited to: odor, potential water impacts, existing soil conditions, plant type and regulatory concerns.	Equipment operator very aware of, and fully educated on all of the issues related to land applied animal waste, such as, but not limited to: odor, potential water impacts, existing soil conditions, plant type and regulatory concerns.	
Ground and Surface Water Monitoring	Ground and surface water sources never tested and no monitoring program is in place.	Ground or surface water sources randomly tested.	A semi-routine monitoring and testing program is in place in loose cooperation with a consultant or agency such as Extension Service, State Ag or DNR, and/or Federal EPA or USDA.	Ground and surface water sources routinely tested under a prescribed program, in cooperation with a consultant or agency such as Extension Service, State Ag or DNR, and/or Federal EPA or USDA.	
Application on non-owned land (see attached example of agreement)	No documentation or signed agreement exists regarding the application of manure on land owned by someone other than the producer.	Old verbal agreement was previously made.	Signed agreement exists regarding the application of manure on land owned by someone other than the producer.	Signed agreement exists regarding the application of manure on land owned by someone other than the producer. Info on rates shared and agreed upon.	

Identification of Strengths, Weaknesses, & Priorities

Step 1: After completing worksheets, identify the strengths and weaknesses of you system.

Strengths of System	Weaknesses of System

Step 2: Identify planned changes or goals to address high risk issues.

Goals or Changes	Estimated resource requirements (capital and operating costs, labor, management, etc.)	Implementation Date
Short Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	
Long Term Goals or Changes		
1. _____	High Medium Low $_____	
2. _____	High Medium Low $_____	
3. _____	High Medium Low $_____	

Identification of Strengths, Weaknesses, & Priorities (continued)

Step 3: "Yardstick" for measuring progress towards environmental goals.

	Year in Which Assessment is Completed			
	20____	20____	20____	20____
Review of Regulatory Compliance				
Number of regulatory issues for which your farm is in compliance?				
Number of regulatory issues for which your farm is out of compliance?				
Site Review				
Number of site issues for which your farm is "Low Risk"/				
Number of site issues for which your farm is "High Risk"?				
Systems and Management Review				
Number of site issues for which your farm is "Low Risk"?				
Number of site issues for which your farm is "High Risk"?				

Activities	Years in Which Significant Progress is Made Towards Goal?	Year in Which Goal is Accomplished?
Short Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		
Long Term Goals or Changes		
1. _____ _____ 2. _____ _____ 3. _____ _____		

Review of Options:

Times New Roman, 11 point text
Top and Bottom margin: 1 inch
Left and Right margin: 1 inch

Appendix TOC

- Field Records
  - **IRR-1**: Irrigation Field Record is used to record each irrigation event. The IRR–1 or 2 forms can be used with all types of irrigation systems including solid-set sprinklers, solid-set volume guns, hard hose travelers, center pivots, and liner move irrigation systems. The irrigatio field record forms would also be used to record applications with a drag-hose injector.
  - **IRR-2:** Cumulative Irrigation Field Record is to record the total annual waste application to one field per crop cycle. It enables the operator to calculate the total nitrogen application to the field and compare it to the recommended nitrogen loading rate.*
  - **SLUR-1:** Liquid Manure Slurry Field Record is used to record manure application from liquid tanks. These forms would be used to record the broadcast or injection of any liquid manure, effluent, and sludge.
  - **SLUR-2:** Cumulative Liquid Manure Slurry Field Record is to record the total annual waste application to one field per crop cycle with a slurry or pump and haul system. It provides for calculating the total nitrogen application to the field and comparing it to the recommended nitrogen loading rate.*
  - **SLD-1:** "Solid" or Semisolid Manure Field Record is to be used to record each application event from a manure box, flail, or side-discharge spreader. These forms would be used to record the broadcast of any solid manure, separated manure solids, bedding, litter, or compost.
  - **SLD-2:** Cumulative Solid Field Record is to record the total annual waste application to one field per crop cycle. It provides for calculating the total nitrogen application to the field and comparing it to the recommended nitrogen loading rate.*
- Pesticides Application Record
- Application Equipment Maintenance and Inspection Record
- Example Emergency Action Plan
- Information on Calibration
- Landowner/Third Party Agreement for Application.

What about: land app rates (budget), balance?

* The record forms IRR-2, SLUR-2, and SLD-2 require the operator to make calculations to determine the amount of N that has been applied to a given crop. The necessary formulas to complete the forms are provided in the first row of the form.